JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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VOL. CIII., No. 2362.—TUESDAY, AUGUST 18, 1908.

EDITORIAL NOTES—GAS, &c.

On Current Topics.

THE reports of the proceedings at the meetings of the South Metropolitan and the South Suburban Gas Companies should on this occasion be read together—the one being in some respects complementary of the other. The former is published in this issue; the latter appeared in our pages a week ago. At both Sir George Livesey presided. At the meeting of the larger undertaking, he confined himself, in his address to the proprietors, almost exclusively to internal affairs; while, at that of the smaller concern, he dilated upon certain questions of broad interest, in these times of particular fertility in incident of moment, both nationally and industrially. But at the larger Company's meeting, though Sir George confined himself to the affairs of the Company, some of his remarks, on serious consideration, can be readily expanded to illustrate how the trend of current events is having dismal influence on the conditions of industry and trade generally. The Company have shared with the other two Metropolitan Gas Companies a decline in consumption during the half year in comparison with the first half of 1907; but the reasons for this are traceable and identical. Bad trade and the increasing cost of being a Britisher and a householder, and living generally, must inevitably drive to domestic retrenchment. The incandescent burner, too, continues to contribute to diminished consumption per consumer; climatic conditions must also influence; and the irresistible greater outdoor recreation and entertainment attractions of the passing time must make a difference to the home requirement for artificial lighting. The littles in their accumulation make a considerable whole.

Of graver importance than these transitory causes of diminished consumption is the brief but telling statement of Sir George which emphasizes how much, in the conduct of industrial enterprises, internal efforts and successes are negatived by external causes. Between 1879 and 1889, the South Metropolitan Company were able to reduce the price of gas by 1s.—to 2s. 3d. per 1000 cubic feet; but now, twenty years later, the Company are still selling gas at the same figure. The tone was almost plaintive when the Chairman remarked, "We have been trying very hard to sell gas at "the lowest possible price for many years, but circumstances "have been much against us." Why is this? The administration of no gas company could have worked harder or more diligently than that of the South Metropolitan Company for the definite end of giving the consumer the best value for the money he expends; and the work, within the bounds of power and of operation, has been crowned with an abundant success in producing the ways and means to the end. But the fruit of the labour has been snatched from the designed purpose by external demands on the revenues of the Company. There has been a great expansion of business—the sales of gas have doubled in the twenty years, consumers have increased largely, and capital and manufacturing charges by improvements and assiduous work have been reduced considerably per unit of output. The savings on the charges for capital alone since the Company first reached the price of 2s. 3d. have been decreased by about 5d. per 1000 cubic feet. All this has disappeared in increased cost of living in these times. Distribution and business exploiting expenses have risen; but they only account for the absorption of a part of the total savings effected internally per 1000 cubic feet. The balance has gone in dearer coal, and to satisfying the obese demands for revenue for Imperial and local disbursement. What has happened to this one Company has happened generally to industry, and dissatisfaction abounds. The position is not made even tolerable, as an unusual passing experience, by the anticipation that the future will be less burdensome in these respects. Everything points to the contrary, with pandering to Socialism and to extremists of various orders. There is no satisfaction in pessimism; nor is there in refusing to intelligently take account of contemporary acts, and of their potential effects. There seems to be no ground for hoping for more favourable external conditions in the immediate future; and therefore to business expansion, lower coal prices, achievements in enhancing the yields of manufacture, and increases in the values of residuals, without any easement in other conditions, must we alone look, until some great and effective change occurs, for the financial improvement that will enable reductions of price to be made. These conditions that apply to the gas industry, in degree apply to other industries. Existence in their case is only continued at increased cost; and the consumers in their case, as in that of gas, suffer in consequence. It seems one of the difficulties of the times to get the mass of the people to understand that the sweating of the general wealth of the country in the manner that is now proceeding is not to the benefit of the community at large.

The cost of coal is still a great drawback to industry. Sir George allowed the subject repose at the South Metropolitan meeting; but he had something to say upon it at the South Suburban meeting. He said, and rightly said, there is not anything in the conditions of to-day to vindicate the coalowners in keeping the price of coal 40 per cent. higher than it was three years ago. They are doing their best now to further curb their own opportunities for trade, which is a suicidal policy. The South Suburban Company have not even at the present time entered into their contracts for the current year. They are living, as it were, from hand to mouth, with a good supply in the cupboard, but without any written and sealed guarantee for a continuance of the supply. But as Sir George puts it, the Company are living very well, by purchasing as they require to purchase; and they find a very receptive market for their orders. We believe that the Company is not the only one that has adopted the waiting policy; and the indications appear clearer than ever that they have acted with circumspection and wisdom. With trade in the condition that it is in to-day, there would have been in the present, had the policy been more commonly adopted by gas companies, a royal scramble among the coal owners for something more tangible and lasting than the mere filling of temporary requirement. There is talk among those in intimate contact with the coal industry of the coalowners having overreached themselves, and of a preparedness here and there to do—if not openly, *sub rosa*—an amount of business at prices that are not the quoted ones. The coalowners, in trying to find material for their own justification, cannot make much of the fact that they have sold for export this year an increased quantity of coal, representing a value (on a total of £24,516,257) of £1,719,466. Part of this is accounted for by the contracts entered into early last year; and against this increased export coal business, the coalowners have to face the ugly fact that there has been the notable shrinkage in our general foreign trade of no less than £58,563,338. Last month alone there was the heavy shrinkage of 16·67 per cent. in the manufactured goods exported from this country. All this puts into shape as positive figured fact what has been generally understood and felt, that the trade of the country is again very much under the cloud of depression; and such general depression as this, means a big set-back in the need for fuel, and reduced buying capacity. The coalowners cannot much longer resist by artificiality the law of supply and demand; and from natural causes must come a decline in coal prices.

There were several other topics under discussion at the South Metropolitan meeting—unaccounted-for gas, and damage to, and robberies from, coin-meters among them. Differences in the times half year by half year of the readings of consumers' meters, and differences in the temperature of the gas as registered at the station meter and at consumers' meters are, Sir George believes, largely answerable for the fluctuations in unaccounted-for gas; but the problem of the moment is, what caused the big spurt in the item in the case

of the Gaslight and Coke Company last half year? There is something abnormal about it; and it can hardly be attributed to conditions that are more or less habitual year to year. Regarding the robberies from prepayment meters, some interesting statistics were submitted by Sir George in reply to a proprietor. Those ingenious minds that have been working at making the money-boxes of prepayment meters proof against the plunderer, will perhaps read with no little personal amazement the statement of Sir George that they have not yet succeeded, as they thought they had done, in producing anything very satisfactory.

From the general to the particular. The proprietors of the big Southern Company are well satisfied with their financial position. They have good reserves; and the price they charge for gas is low for London. The strength of the Company is in a low price, notwithstanding that the charge at present is not the lowest in their history; but this price is only possible by other strong features in the constitution of the concern. The constant increase in the number of consumers is a feature, too, of great importance in considering the future; and it is one among other reasons for looking to an early release from the state of development-suspension into which the concern has temporarily fallen, though not through any abatement of activity. The Company are not alone in this temporary suspension of business advance. They are only representative of others close at hand and farther afield, both in the gas and other industries. Complaint of poorness of trade, and of the stringency of conditions, is abroad. Who can escape from the effects in one form or another?

Commercial Gas Company's Affairs.

One of the most thinly attended meetings that the Commercial Gas Company have held for many a year was that which the Chairman (Mr. W. G. Bradshaw) addressed last Thursday on the trading of the past half year and the prospects of future business. The prospects are subject to the drawbacks from which all industries are temporarily suffering, and to those that the Legislature have been busily engaged in fabricating during this session, and hope to complete in the course of the autumn sittings. The past half year has not been quite so satisfactory for the Company as numerous preceding ones. They, too, have had to face heavier expenditure, and a diminished consumption of gas by about 1¾ per cent., with the result that the gross profit was less, notwithstanding the penny increase in the price of gas, by £6832. The penny addition to the price of gas could not, in itself, possibly have had any effect upon the sales; but the reduced consumption must be attributed to the same conditions (more or less intensified) that apply to the other Metropolitan Companies, and to which allusion is made in the comment on the affairs of the South Metropolitan meeting. The East End of London, with, in addition to its large industries, its myriads of small ones, is a sensitive indicator of the vibrations of trade; and to this, more than to anything else in this area, there is hardly any room for doubt, is due the decline in gas consumption in the half year, and which decline is an unusual experience. The decrease in the balance of profit is, of course, principally owing to the higher cost of coal and the disappointment that was experienced over the return for residuals. The Directors did not expect that the 1d. increase in price would compensate them for the additional charges they foresaw would be incurred; but what they did not foresee was the reduction in the demand for gas, and the partial failure of their hopes in regard to residuals. However, the position is not a bad one calling for sympathy; it is merely a position created by temporary causes, for which adequate provision, and much to spare, had been made in the balance of undivided profit. The conditions as to reduced consumption and increased costs, together with the fact that twenty years' service on the Board will be completed by Mr. Bradshaw this year, induced him to fall into a little retrospection, from which the two salient facts may be drawn—that, in the period named, the sales of gas have expanded by 71½ per cent., and that in the second half of the period the average price paid for coal has been 9s. 9d. per ton f.o.b. in the North, as against 7s. 4d. per ton in the first decade. Over the former fact there can be rejoicing; the second one does anything but stir up feelings of gratification, especially when we contemplate the possibility, on drawing together the adverse circumstances that menace, of the average price of coal being even greater in the next decade than it has been in the past. The overdrawn capital account points to the Company soon being in the market with a fresh issue of capital. Not the least pleasing feature of the meeting was the Chairman's eloquently phrased appreciation of the value of co-partnership.

The Irish Association Meeting.

So frequently are we dealing with the larger and general affairs of the gas industry, that it is quite a change to have attention diverted to the work of the smaller undertakings, which in the aggregate form a considerable whole. Ireland is a land of comparatively small gas-works. The large ones are the exception; the small ones the rule. But nevertheless it is exceedingly pleasing to the observer to see the go-ahead methods of the officials in charge of the greater number of these concerns. They are active in keeping abreast of the times, so far as their environment will permit and their Committees and Boards of Directors are not obstructive. In the majority of cases, condition is not favourable to the adoption of many of the economy-producing devices that are open to the larger works; to adopt them, would result in the opposite of economy. That is a drawback under which the managers labour; but, step by step, they work to bridge the difference between the disenabling output and the output that enables a reasonable application of the newer order of things. In kind, many of the difficulties encountered by the managers of these undertakings are similar to those that have to be met by the managers of the very largest undertakings; and the less magnitude does not for the individual diminish worry and anxiety. As a matter of fact, there are affairs accompanying smallness and isolation that harass the manager in a degree to which the manager of a larger and more conveniently situated works, with an abundance of resource, would treat as incidents hardly worth notice. Capital expenditure per unit of output is necessarily fairly high; transport of materials is frequently costly through unfavourable situation; the consumption per connection is for the most part of a somewhat diminutive order; and the whole output is relatively small over which to spread standing and other charges. The consequent fairly high price of gas makes the struggle with competitors such as oil, acetylene, electricity, and suction and producer gas plants more difficult; and upon the restricted conditions for business has come the consumption reducing incandescent gas-burner.

When these points are all considered, it is cheerful reading with which Mr. Thomas Frizelle provides us in the Inaugural Address that he delivered last week to the Irish Association of Gas Managers meeting in Holywood, over the gas undertaking of which town he presides with so much ability. The past twelve years cover the period of severest competition; and yet in this period the gas-works of Ireland, with all the thwarting conditions, have increased their sales of gas by more than 50 per cent. The advances in the numbers of consumers and cooking-stoves are also highly satisfactory and encouraging; and they speak of progressiveness and the active exercise of a commercial spirit. And in the advocacy of up-to-date methods of gas utilization, the managements are not a whit behind their more fortunately circumstanced brethren. He must be an excellent business manager who can make progress under the most adverse of conditions; and, to those who have already done so well, such progress as the President records must be a stimulus to increased effort. Mr. Frizelle in his address (which was published in our columns last week) impresses the value of observation, and the application of improved method in manufacture, and attention to the little things that sometimes yield big results. Moreover, he practises what he preaches; and we heartily congratulate him upon his make and sale of gas per ton of coal carbonized, and the enviable position of his capital account. A reduction of capital from £1352 to £450 8s. 4d. per million cubic feet of gas sold, with an annual output of only about 24 millions, testifies more in the eyes of his professional colleagues than would numerous other details.

The principal technical subject was brought before the meeting in a lecture by Dr. Harold G. Colman; and it is commented upon in a separate article. There were two papers read—one by Mr. J. Brodie entitled "Some Obser-"vations on the Distribution Department;" and the other by Mr. J. F. Tyndall on "Methods of Charging for Gas." As charging for the gas comes after distribution, the paper submitted by Mr. Brodie (which we are compelled to hold over till next week) may be noticed first. The author takes a

broad view of distribution, including within it the means of utilizing the gas. As a matter of fact, "distribution" proper is limited in the paper to a reference to the use of long lengths of steel tubes as contributing, through fewer joints, to the reduction of that much-discussed item just now, unaccounted-for gas, which has a tendency, through various causes—among them higher pressures and the vibration caused by heavier traffic—to increase. In this connection, he introduces to notice the new Mannesmann steel tube, with, on a horizontal line through the section, thickened parts for affording a sufficient depth of screw-thread for service connections without the use of clips or other special jointings to which gas managers have hitherto had recourse through the thin uniform thickness of the pipes not affording, in their opinion, a sufficient depth of thread. The remainder of the paper contains several useful wrinkles, but is mainly devoted to showing the advances in efficiency of incandescent gas-lamps, and to an exposure of the ill-founded and easily disproved claims of electricians to the possession of the more economical lighting agent.

If we omit a few of the phrases employed by Mr. Tyndall in the course of his paper on "Methods of Charging for "Gas," we do not find ourselves in the main greatly out of agreement with him. He approves of a uniform system of charging, with discounts on fixed quantities ranging from 5 to 25 per cent., and a special discount for prompt payment. The fairness of this is readily admitted. He abhors differential prices, but albeit has found moderate ones very useful in building up a day consumption, and in assisting in making a reduction of 3d. per 1000 cubic feet on the lighting rate. We are as strong as Mr. Tyndall can be against extremes of differential prices, and especially such extremes as he points out, unless there is some abnormal justifying circumstance. But where we disagree with him is that he would only take quantity as the basis of differentiation, and disregard entirely the purpose for which gas is used. Such differentiation as he proposes is met entirely by a scale of discounts. "Differentiate by all means," he says; "but do "so from a common basis irrespective of purpose." Later on he remarks: "Gas is a commercial commodity in com- "petition for its existence on merit alone." That is an excellent assertion, and one with which we are in total accord. But consider that assertion adequately and dispassionately, and it will show conclusively that, in fixing prices, it is impossible to ignore, within limits, the purpose for which gas is to be used, and the merit of the competitors that have to be met in each distinct branch of the gas business. It so happens, however, that gas for all domestic purposes can hold its own in the competition on its merits, including (as a rule) cost; and in this line of business extraordinarily large consumption can be satisfied easily by a discount. But for power, gas cannot, at the common ordinary lighting rates (more particularly those obtaining in Ireland), compete on its merits only with the rivals, nor for most other industrial purposes for which fuel is required. And it is this industrial and manufacturing branch that must be regarded as a business for gas altogether distinct and apart from that of domestic use.

Let us close our eyes for the moment against the fact that there exists a domestic part of the gas business; and look upon the industrial and manufacturing field as an independent market for gas. We have a commodity with which we want to do business in that field; it is a field in which the business can be done in the day time; but we have to meet competitors in the field of a strength that is not encountered in any other class of our business. If we are to effectually meet them, gas must be supplied for these purposes at a low figure—a figure that will pay works costs, and will contribute something over and beyond towards meeting capital charges. Now are the domestic consumers to be denied the assistance of this contribution to the requirements of capital, simply and solely because we are obstinate in our opinion that management, establishment, and other costs should be contributed to equally with the lighting consumers by these day industrial consumers? If obstinacy loses this custom, then the domestic consumer is still left with the whole burden of the ordinary costs, and in addition with the full capital costs upon the plant necessitated by the peak load at lighting hours. "It is trifling "with the question," observes Mr. Tyndall, "to say that the "higher rated consumer is not injured by the lower price." It depends upon what the price is. It is, in our opinion, trifling with the question to say that the higher rated consumer is not injured by the rejection of any contributions to capital expenses that could be gathered in in the daytime if the gas manager and his board or committee had not adopted an inflexible rule, and had not evicted from their methods the true commercial spirit. It is not true, too, that, "if the price charged on the lower scale for certain business "is a commercial and profitable one, that the same price "should be so for other purposes." But it is true that "gas is a commercial commodity in competition"—not in one direction, but in several—"on merit alone;" and, as between industrial and domestic use, the business should be considered independently on merit, and the former, if cultivated, as ancillary to the latter. If our commodity was one of single utility, then we should say Mr. Tyndall was right. Theoretically, all he says might be characterized as correct; but in practice—well that is quite another matter. We never forget, in dealing with this question, the observation of a gas manager of some thirty years' standing, whose day and night business has increased remarkably the last few years, who is selling gas for domestic purposes cheaper to-day (and paying, too, a higher dividend) than in the whole history of his company, and who a few years ago was forced, by the circumstances of the time, into offering special prices to retain certain industrial connections. He said: "We who are in the "middle of this industrial competition have now to do many "things that we should in former times never have thought "of doing." The special prices he is getting for his industrial consumption gives him a little profit above works costs. He prefers to take it rather than throw it away. There are many items on the expenditure side of the revenue account that would remain precisely the same, though he sacrificed the business referred to. Why should he rob the rest of the business of the assistance of the profit so made? He cannot, nor can we, see. Changed conditions must deprive us of some of our ancient usage in regard to gas charges; and even Widnes and Sheffield agree.

Hydraulic Main Conditions and Retort Pressures.

The gas-works of small output, as we have persevered in showing and illustrating from work actually done, and as the President of the Irish Association has also proved, are not, by their limitations, excluded from the enjoyment of many of those improvements in working that inure to the greater efficiency of gas manufacturing plant. The importance of attention to small things has been a pregnant text; and many have profited—both those in charge of large and small gas-works—from the insistence displayed in keeping it in view. Looking at the poor working results of a number of undertakings, a text with a forcible exposition putting the reverse side—such as the waste due to the neglect of small things—might assist in bringing home to the negligent (which expression does not necessarily mean the officials) more directly the evils of carelessness and supineness from which their undertakings are suffering. Quite small regulating rules in the processes of manufacture have—history repeats itself with cumulative emphasis—very material effect upon results; and herein is centred the moral of the lecture that Dr. Harold G. Colman delivered last week at the meeting of the Irish Association. He chose for his audience an apposite subject—the effect on practical working of the seals and pressures in the hydraulic main and the retort. He did not tell categorically or in substance but merely generally what is the effect on practical working; and he could not, in such a lecture, do much else, seeing that the material effect is, of course, also varied by conditions other than those existing in the hydraulics. But these latter conditions, improper or proper, transmit pressure-effects to the inside of the retorts; thus contributing, according to their character, to the qualitative and quantitative depreciation or appreciation of result. He showed what were the right and wrong conditions; and how they were to be respectively obtained or suppressed.

The problems of the hydraulic main have of late years expanded in importance. They ought to have done so long before. The lessons have been learned that the greater the practical refinement existing in that at one time crudely fitted, oft-neglected, and by many but vaguely understood, part of the plant, the greater the effect upon the make. It is singular that the importance of these matters should have been so long consigned to oblivion. Dr. Colman points out the effects, in producing oscillations of pressure in retorts, of inconstancy of vacuum in the hydraulic main, of the depth of seal, of the degree of the fluidity of the sealing liquor, and of the bubbles caused by the gas issuing from the dips

setting up an undulatory motion on the surface of the liquor. But all these matters were brought by Mr. William Young before the North British Association, in a paper to which Dr. Colman refers, as far back as 1877. Though so many years have elapsed since that great penetrating power of Mr. Young, which so frequently successfully detected cause and traced effect, or traced backwards effect to cause, enabled him to point with decision to the depreciatory action on make of the fluctuations of condition in the hydraulic main, their remedy has only of comparatively late years been a matter of serious and deliberate study. Dr. Colman has the gift of drawing together the threads of a case, and giving it to us in clean woven piece; and his lecture is valuable for setting these depreciatory conditions of seal and pressures in proper light, and for stating the best known means of eliminating them.

The retort-house governor removes part of the causes that create alternations of pressure and vacuum in retorts; but it does not completely eliminate them. It regulates the vacuum in the hydraulic mains, suppresses the pulsatory effects of the revolving exhauster blades, and so enables light seals to be used. By removing these disturbing influences, it does its part in securing more uniform conditions in the retort. Beyond this, as previously said, there is the level of the dip-pipes and of the sealing liquid, which sealing liquid has its surface set in wave-like motion by the variations of the emission (thus locally causing ever-changing depths of seal) of the gas from the different dip-pipes; and the degree of intensity of the motion is governed largely by the character of the bubbles formed at the outlet of the dips. There is, too, the variation in the consistency of the liquor. How to govern these disturbing factors, partially if not completely, is known to many; and those who are not acquainted with them will find that Dr. Colman, in his lecture, sets them on the right path. Among other things, he presents a new method of maintaining a level seal, and of automatically drawing off the tar from the hydraulic main, so as to keep the liquor in a state of fairly uniform fluidity. It is the invention of Mr. L. Trewby, the Engineer of the North Middlesex Gas Company, and of his assistant Mr. Allan. One great advantage is that it relieves the retort work of the labour of periodically removing by hand the tar from the now increasingly-used collecting towers. The reduction of the size of the bubbles of liquid—thus mitigating the undulatory motion of the sealing liquor—by knife-edged or serrated-ended dip-pipes, or adjustable collars with square cut serrations, is also dealt with in the lecture. There is no great expense attached to the remedial plans for modifying the pressure oscillations in retorts; and the results more than compensate. But when between the working of one period and another, there is a substantial gain in make, care must be taken not to ascribe all the improvement to the elimination, as far as is possible and practicable, of pressure-disturbing influences, without first being assured that there are not other contributory circumstances. However, in the maintenance of as nearly uniform pressure as possible in the retorts, there is material advantage to be reaped from the work of carbonization by the manager of the small gas-works, as well as of the large ones; and that is just what Dr. Colman wished particularly to emphasize.

Co-Partnership Still Spreading.

There are fresh adherents to the principles and practice of co-partnership. The men of the Tottenham and Edmonton Gas Company have enthusiastically adopted the scheme, which was approved by the proprietors at their meeting on Saturday week. The Tunbridge Wells Gas Company are giving the scheme a trial for three years; and the Chairman (Mr. W. H. Delves), Directors, and officials—Mr. Andrew Dougall, the Engineer and General Manager, and Mr. C. F. Catt, the Secretary—are confident, from the hearty demeanour of the men over the project, that the three years are going to prove to them the soundness to the core of the system, as it has been proved by other companies. At the meeting, too, of the Bournemouth Gas and Water Company next Friday pursuant to notice, the Directors will submit to the proprietors for approval a draft scheme "inaugurating a system of co-partnership or profit-sharing among the officers and employees of the Company." It will be remembered the Engineer and General Manager of the Company (Mr. Harold W. Woodall), when occupying the presidential chair of the Southern Association of Gas Engineers and Managers, in his address, spoke of the complaints that were heard of the carelessness, thoughtlessness, and slackness of the average man. "These complaints," he added, "are often justifiable; and the position is likely to become worse if employers of labour are content to swim with the tide rather than bestir themselves to meet the altered conditions of labour. I believe that eventually salvation will be found in profit-sharing." And again, in the discussion on the paper that Sir George Livesey read before the Association on Nov. 14 last, the President remarked: "It must be clearer and clearer to all every year that the conditions under which labour is employed are varying, and varying very rapidly, and that capital must take steps to meet the change." Capital in the case of the Bournemouth Company is going to meet the change.

The Scheme at Tunbridge Wells.

In all these cases of new adoption, the principles of the schemes follow the lines of the proved system of the South Metropolitan and South Suburban Companies, with variation in terms. An outline of the Tottenham scheme was published last week in the report of the speech of the Chairman at the meeting of the proprietors. Regarding the Tunbridge Wells scheme, it is to be adopted on trial for three years. Each man's wages is to be treated as his capital investment in the Company; and the bonus will be paid on this amount, regulated by the price of gas. Every penny off the price will represent an extra 1 per cent. bonus; if the price goes up, the bonus will be reduced. At the present price of gas (2s. 8d.), labour will represent capital with a 4 per cent. investment; and on the next 2d. by which the price is lowered (it is understood this is not a remote possibility), the wages will represent a 6 per cent. investment. For five years, the bonus credited to each employee will not be withdrawable, in order that he may build up a holding of stock in the Company as soon as possible Upon any savings he likes to add to the bonus, he will receive 3 per cent. interest, until it is of an amount sufficient to invest in stock. By his own thrift and exertions, each employee may thus become a stockholder earlier than he otherwise would do. After the first holding of stock has been attained, the bonus will be divided between a withdrawal account and a trust account. It is estimated that 40 per cent. of the expenditure of the Company represents payment for the services of the employees; the South Suburban Gas Company spend £58,000 a year on salaries and wages, and the South Metropolitan Company spend about £300,000 in the same directions in a half year. When such figures as these are considered, it must be conceded that they represent something constituting a potent agency for good or evil in connection with a commercial undertaking; in other words, the figures show scope for substantial losses or gains. Those Boards of Directors that require information about the system should write to the Secretary of the South Metropolitan Gas Company for a copy of Sir George Livesey's Southern Association paper, with the discussion; and particulars can also be obtained from the paper and discussion at the recent meeting of the Institution of Gas Engineers. These publications put before us the *pros* and *cons* of the question; but, with respect to the latter, nothing has yet been advanced to shake the solid facts that years of experience have yielded.

The "Lancet" Finds a Mare's Nest.

The announcement made by the Governor of the Gaslight and Coke Company (Mr. Corbet Woodall) that the unaccounted-for gas of that large concern, with a distributing area containing a considerable square mileage, had increased in the past half year, compared with the corresponding period of 1907, by about 122 millions, making the total rather more than 7½ per cent. of the make, has caused a little flutter in the daily press, and the electrical press has also made reference to the matter. These could all have been passed by without notice, had the "Lancet" not—emulating the public-terrifying policy of certain papers aided by the bacterial, microbial, and toxical enemies of man—gone out of its way to publish some fatuous remarks (which have been copied into the halfpenny daily papers) about the fearful volumes of poison the Gaslight and Coke Company are pouring into the air of London day by day. Our medical contemporary says that at least 10 per cent. of this gas, probably more, is the powerfully poisonous carbon monoxide. "No wonder," it continues, "when there is no movement in the air, and when there is stagnant mist or fog present (a time, by the way, when the supply of gas is in great demand) Londoners are found to

complain of headache, dizziness, and oppression, all three of which symptoms are readily invoked by chronic doses of carbon monoxide." Our medical contemporary is obviously unaware that "unaccounted-for gas" does not necessarily mean leakage into the open air. Even if it did, space and time would be against the frightful consequences of the leakage that it so vividly describes Supposing, however, there was this diffusion of the 10 per cent. of carbon monoxide into the limitless atmosphere of the universe, how dreadful it would be!

"Unaccounted-for" or Leakage.

But let us clear up the point—plainly a point not understood by our contemporary—as to the difference between unaccounted-for gas and leakage. As Sir George Livesey pointed out at the South Metropolitan Gas Company's meeting, a large part of it is accounted for in an individual half year by the fact that all the make of gas is brought into account; but the time of taking the registration of the consumers' meters, occupying some three weeks, produces, according to the season of the year, a considerable difference in the quantity accounted for in the half year. Then a portion of it is attributable to the 5 per cent. margin allowed by statute—3 per cent. in favour of the consumer, and 2 per cent. in favour of the gas purveyor—in the registration of consumers' gas-meters. There is also the difference between the temperature (higher) at which gas is registered at the works' station meters and the temperature (lower) at the consumers' meters. The importance of this can be seen by anyone who observes the effect of the sun on a hot day on a gasholder in which gas is stored, but into which further gas is not being passed. Between the works' station meter and the outlet of the gasholders on cold days, the difference in registration, tests show, is something considerable. There is, too, the condensation in the gas-mains, the stolen gas, the (in some cases) unregistered gas of pilot lights, and the differences in consumption of the public street lamps, where, instead of every lamp being metered, the average meter system is in vogue, or the consumption is merely estimated. This is a pretty substantial list of loopholes for "unaccounted-for gas." After all, the unaccounted-for gas—not all necessarily leakage—of the Gaslight and Coke Company last half year was only about 2½ per cent. more than the very ancient general average of gas undertakings of about 5 per cent. The point the Governor made at the recent meeting was as to what caused the considerable and phenomenal excess of unaccounted-for gas in the half year; and he suggests the new street conditions in the heart of London as being largely to blame. But he did not suggest that the Company's total of unaccounted-for gas was being blown away in the air in the manner named by the "Lancet." Surely, our medical contemporary confesses to shortsightedness in only, at this time of day, finding out (in the exercise of keen imaginativeness) the cause of headache, dizziness, and oppression when the air is heavy and stagnant, and when mist and fog abound. Cannot the "Lancet" devote itself to something more useful than trying to effect a scare on insufficient knowledge, and not give a lead to papers like the "Daily Express" to manufacture such startling headlines as "Poisoned by Wasted Gas," and a "New Menace to London's Health?"

Modern Retort-Settings.—Some time ago, Mr. G. P. Lewis contributed to the "Gas World" a series of articles on "The Construction and Working of Modern Retort-Settings;" and they were reprinted in book form. A second edition has now been published, in which the chapter treating of the construction of retort benches and settings has been extended to embrace vertical retorts. Additions have also been made to the chapters on the analysis of flue and waste gases and on pyrometry, as well as to the appendix.

Cleaning Gas-Conduits.—A simple method of cleaning gas-conduits was described by Mr. W. D. Mount in a paper read at the last meeting of the American Society of Mechanical Engineers. It had reference to an installation of a battery of gas-producers for continuous operation; and it was described and illustrated in a recent number of the "Iron and Coal Trades Review." In order that no shutting down should be necessary from collections of dust in the conduits, cleaning-holes were provided in their upper sides, through which a long bent pipe could be inserted periodically for dislodging, by compressed air, all accumulations. The holes are normally kept closed by heavy conical plugs of cast iron, and when the cleaning-pipe is in use the joint is made tight by a ball-sleeve that fits over the pipe and into the hole. In this way the dust is successfully blown out in the direction of the furnace without interruption or disturbance to the regular supply of gas.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 471.)

THE Stock Exchange has, on the whole, had a very fair week's business, considering the time of year, and the fact of its being account week. The settlement was not a difficult operation, and this helped to throw a ray of brightness now and then on the markets. Movements were somewhat variable; and the best prices did not last up to the close—the American Market having a considerable set-back. On Monday, though business in the aggregate was quiet, there was animation in some lines of the more speculative class. Americans were buoyant, and South Africans good; but gilt-edged were rather dull, with a slight fall in Consols. This was changed on Tuesday, when Consols and some other choice things revived as buyers came in. Home Rails were still rather lame; and Americans began to look cloudy. Wednesday's features were much the same as Tuesday's; Consols and such-like being in demand, while some weakness was apparent in other lines. Prices were for the most part fairly maintained on Thursday, but some gilt-edged issues advanced. Home Rails were a little more cheerful, and Americans closed a trifle higher. The announcement of one small failure had no effect. A turn for the worse set in on Friday, when realizations caused prices to give way. Consols fell a small fraction, and some other gilt-edged stocks were easier. Railways were quite lifeless; but one or two speculatives lines did pretty well. Saturday was very quiet, and things as a general rule were dull. In the Money Market, there was an abundant supply at easy rates; but discount stiffened materially. Business in Gas was on a holiday scale, with the addition of a spurt or two now and then. The tendency was firm, and several issues advanced, especially on *ex div.* adjustments. In Gaslight and Coke, the ordinary was in demand at 99¾ to 100¼ *cum div.* and 97⅛ to 98⅛ *ex div.* In the secured issues, the maximum marked 88½ *cum div.*, and 86⅛ and 86⅝ *ex div.*, the preference 108⅛ *cum div.*, and the debenture 83⅜ and 84⅛. South Metropolitan was active and buoyant, marking 122 *cum div.*, and from 119 to 121 *ex div.* Commercials made 110 and 111 for the 4 per cent., and 105 for the 3½ per cent. In the Suburban and Provincial group, Brighton "A" changed hands at 157, Brentford new at 182 and 182¾ *ex div.*, and Hastings 5 per cent. at 113. The Continental Companies were inactive. Imperial was firm at 181 to 181¾, Union marked 111, and European fully-paid 23. Among the undertakings of the remoter world, Buenos Ayres was done at 11½, ditto debenture at 92 and 92¼, Monte Video at 11⅝, Oriental at 142½, Primitiva at 6, ditto preference at 4 15/16 and 5 1/16, River Plate at 13 3/16, and ditto debenture at 93.

ELECTRICITY SUPPLY MEMORANDA.

Injury from Different Points of View—Vehicular Damage to Lamp-Posts—Conduit Explosions—Metallic Filaments at Hammersmith—At the Peak of the Load—The Monthly Cleaning of Metallic Filament Lamps.

LAMP-POSTS of various kinds seem to be very susceptible to the attentions of motor cars, omnibuses, and so forth, and give way before them with a willingness that is not altogether admirable. Lamp-posts have been built for the purpose of performing certain functions; and these they accomplish with more or less satisfaction and dignity, providing they are not unduly interfered with. Of course, it cannot be expected that all the legion of lamp-posts standing in the country can be bulwarked in such manner that they can offer an effective resistance to the onslaughts of motor 'buses and so forth. Such fortification would make our streets more hideous than they are in this day by the presence of the heavy and ugly structures that are considered necessary for electric arc lamps and the overhead trolley-wire system for tramcars. However, street lamp-posts were an institution before mechanical road-locomotion came along to upset the ordinary man's notions of the fitness of things in relation to our streets, their equipment, and safety precautions; and as old inhabitants, the lamp-posts should be protected, just as gas and water mains should be protected against damage by wayward electric currents. Electric authorities say that full protection for gas and water mains should not be given; and that they—the electrical authorities—ought not, as providers of a public service, to be penalized for the mischief that their current does, though when gas happens to be the evil-doer the boot is on the other leg. But it is a frequent observation that electricity suppliers are not consistent in their views. "If we do damage to gas or water mains," they say in effect, "it is not through any lack of care, and we ought not to be punished; but if anyone does damage to us the matter is different, and we ought to be fully and properly compensated." This is not denied; it is the illogical character of the argument that is the interesting point. Electricity distribution came after gas distribution; and the motor bus came after electricity distribution. The motor cars and buses knock down electric light standards; and the electric light people or the municipal owners of the standards do their best to see that the injury occasioned is adequately paid for. Again, we say they are not to be censured for this; it is exactly what the gas industry desires in respect of their property buried and exposed.

In regard to this question of damage to street-lamps, the law is

not so precise as could be wished. This was pointed out in references (through leaderettes in the "JOURNAL") to certain cases not long since; and it is a matter in which gas suppliers are quite as much concerned as electricity distributors. One or two fresh cases have come before Courts. One heard at the Kent Assizes was a very simple matter; and damages were obtained. The electric light standard was one at Tunbridge Wells. It was a standard of healthy parts. It stood some 18 feet above ground; had its root embedded in concrete, 3 ft. 8 in. below the ground surface. The concussion produced by the unfriendly attentions of a motor car, the property of Mrs. Gerard Leigh, laid low all of the standard that was above 3 feet from the ground, at which point it was 7 inches in diameter and 1⅛ inches thick. Mrs. Leigh has had to pay £27 12s. 6d., the cost of replacing the standard; and there is no reason to question the justice of the decision. But here is another which is described by the Magistrate sitting at Marylebone as one raising "a pretty little point on a first principle of law." The Paddington Borough Council were the aggrieved parties in this instance; and they sought to recover £1 1s. 2d. cost of damage that Albert Neal, a driver in the employ of the General Omnibus Company, had done, "carelessly or accidentally" to one of their lamp-posts. The facts of the case were perfectly clear; and they pointed to the damage having been accidentally occasioned through a Dairy Company's van passing the bus on the offside—it was a horse bus this time—and then pulling across the heads of the bus horses, which act threw the latter vehicle against the lamp-post. The contention of the Borough Council was that, though the damage was accidental, the bus was the vehicle that did the injury, and therefore the driver was responsible. The bus, it was decided by the Magistrate, was only the damaging instrument in the hands of someone else; that the driver could not be said to have been the person who caused the damage; and that therefore the summons must be dismissed. The Council are to consider whether, in view of the importance of the matter, the case shall be carried further. While justice must be done though the heavens fall, we can see this case suggesting in future ones the shifting of blame on to other shoulders as often as any semblance of conditions will admit. Meanwhile the Borough Councils are showing much genuine alarm over the unnatural prejudice that motor-cars evince towards street-lamp standards. It has been reported to the Marylebone Borough Council that, within six months, 260 of the street-lamps have been damaged by vehicular traffic—motor and other. The Lighting Engineer of Islington reports that within recent weeks no fewer than 26 lamp columns have been knocked down or otherwise damaged by motor traffic. This sort of thing is really very objectionable; but better lamp-posts be sacrificed than persons.

At Leek, there has been trouble from accumulations of gas in the electric light conduits. There seems to be a certain amount of harmony between the name of place and the subject. There was an explosion in February last; and a Joint Sub-Committee have decided that each department must pay its own costs of repairing the damage. Providing the Sub-Committee were quite satisfied that the gas was coal gas, there is a fairness about their decision, inasmuch as, whatever the gas, it is quite harmless until a defective cable or an opening of some kind in the conduit causes the explosive mixture that has been formed to be fired. The Sub-Committee have gone on the lines of contributory negligence and responsibility; and there appears to be a certain amount of sense in this, although the change in the character of traffic in our streets and the more frequent opening of the roadways for the public services are imposing greater hardship and expense on gas distributors, through fractures, the loosening of joints, and disturbance of surrounding soil. On the other hand, if the conduits of electricity suppliers were gas-proof, and cables without defect, there could be no explosions from coal gas, but only from self-generated gas, as in this case generation and firing would have one common cause. However, the Gas Engineer and the Electrical Engineer of Leek are to consider the best way of preventing accumulations of gas in the electric light conduits. It is a big reference; and we hope they will succeed. But while coal gas is not the only brand of gas that contributes to these eruptions, there may still be surprises in store, however good the preventive plans.

Central station engineers are living just now on expectation; and, by its aid, they are keeping their spirits up. They see the units consumed for lighting peeling off at a somewhat rapid rate; but among them are those who expect that the time will come when the number of lighting consumers will restore to them the old volume of lighting business. Still, whatever additional consumers are obtained, the ratio of profit to the business done must be a declining one on account of the larger capital outlay in the distributing department for obtaining a smaller order of business per consumer than formerly. The Hammersmith Borough Council Electricity Department in the last financial year only had an increase in consumption of 117,728 units; but it is not stated, in the notice of the report before us, in which line of business —lighting or power, or both—this increase was secured. The information, however, is given that the check to the rate of increase is the new metallic filament lamp. It is confessed by the Borough Electrical Engineer that the new lamps have prevented some of the dissatisfied electricity consumers carrying out their threat to return to gas. It is new to have central station engineers confessing that such a thing as dissatisfaction could possibly exist with electricity. By central station engineers the virtues of electricity are, as a rule, advertised as being altogether complete and perfect.

However, this reduced rate of increase in consumption at Hammersmith may possibly have some connection with the reply that has been sent to a petition of the Board of Guardians for a reduction in the price charged them for current. The Electricity Committee of the Borough Council know they hold the Guardians in the hollow of their hands. The scandal as to the gross waste over the Hammersmith Workhouse and its electric lighting equipment is fresh in memory; and the Electricity Committee of the Council realize that the Guardians would not, in the face of the revelations at the inquiry, care to risk the result of an application for a loan for putting down an independent electricity generating plant of their own. The Electricity Committee feel pretty safe therefore, with the "palace" fitted up for electricity so gorgeously and regardless of expense, in snapping their fingers at the Guardians' request for more lenient treatment in respect of the price of current. But why are the Guardians asking for a concession? Is it not constantly being said by the electrical experts who are consulted on the lighting of workhouses, lunatic asylums, and such-like public institutions, that electric lighting is unequalled for lowness of cost among the illuminants; and thereupon do not journalists of the electrical industry clap their hands and make a joyful noise? We cannot understand the anxiety evinced by the Guardians for a lower price under such circumstances. Perhaps some kind friend will be able to tell us the annual cost of lighting originally estimated by the experts for the workhouse, and the amount that has actually been paid during the past year.

The reason given by the Electricity Committee of the Borough Council for turning a deaf ear to the entreaty of the Guardians is that, though the Board are large consumers, their demand comes on the peak of the load; and the Board do not therefore constitute a very profitable consumer. Consequently, the Committee do not think that, from a business point of view, the Guardians are entitled to any abatement of the ordinary rate of charge for the supply of consumers. This is a knock-down blow for these Guardians, who looked upon themselves as excellent customers. Electrical arguments, however, become very confusing. Public lighting comes on the peak of the load; but the electric street lamps are supplied at 1½d. per unit in Hammersmith. The Councillor experts at Hastings and Tunbridge Wells also know how to generate current for the public lamps at the time of the peak load at costs that are little short of miraculous. Now why cannot the Hammersmith Electricity Committee do a good turn for the Guardians by putting their shoulders to the wheel, and generate current for them the same as they do for the public lighting at the peak of the load at a lower price? If it were not that the sale of electricity is supposed to require treatment different from all other articles of commerce, we should point to the fact too that the public electric lamps that are supplied at a low price per unit are distributed about the borough, while in the Board of Guardians the Borough Council Electricity Committee have one large customer whose supply is delivered through one service connection—perhaps two. But extent of demand for electricity sometimes makes no difference at all—sometimes it does. In this case, for instance, the Guardians are not, according to the Electricity Committee, entitled to anything more than any one of a large number of small private consumers whose aggregate consumption only equals that of the Guardians; but the public lamps are entitled to special consideration. Both are public institutions. It is an interesting world; and electricity purveyors have done something to add to the interest.

We are indebted to the "Electrical World" for the following information, and trust that there will be no objection to passing it on to any of our readers who may have been cajoled by electricians into believing that incandescent gas-burners and oil-lamps were the only instruments of artificial illumination that require occasional attention. It has been shown (remarks our contemporary) that, in a large city where soft coal is used, incandescent lamps and Holophane reflectors will lose from 10 to 35 per cent. in efficiency within a period of six weeks, by the accumulation of dust and dirt on the lamp and reflectors. As the tungsten lamp filament is very fragile, and becomes more brittle with age, a special system of cleaning is necessary, and the following procedure is recommended: The lamp cleaner should provide himself with a pail of strong soapsuds and water, a small scrubbing brush, 4 in. or 5 in. long with stiff bristles, such as is used for cleaning vegetables in the kitchen, and several rags for washing and wiping. To provide against breakage, the lamps and reflectors should be cleaned while the lamps are burning, as the filaments are then soft and plastic, instead of being brittle as they are when the lamps are cold. The cleaner should first turn on the lamp which he has to clean. It would be well for him to be provided with a pair of dark glasses, as continued working with lighted tungsten lamps is likely to result in injury to the eyes. He should first carefully wash the lamp bulb and the inside of the reflector with a rag wrung fairly dry; and this should be followed by wiping. The cleaning of the outside of the reflector can be done either with a dry or damp brush, brushing lengthwise of the prisms or creases. Ordinary wiping with a cloth will do no good on prismatic reflectors because the cloth will not get to the bottom of the prisms. It will not be necessary to wipe the outside of the reflector dry. This cleaning should take place about once a month. Interested readers will please take note of these very explicit instructions.

PERSONAL.

Mr. W. J. Couch has been appointed Secretary of the Camborne Gas Company in place of the late Mr. W. Bailey.

Mr. George Parkhouse, who has been an Assistant at the Holsworthy Gas-Works for several years, has been appointed Manager of the Chudleigh Gas-Works.

OBITUARY.

The death is announced, at the age of 62, of Mr. H. W. Tyrwhitt Drake, the Chairman of the Maidstone Water Company. The deceased gentleman was selected for this position some ten or eleven years ago, when Maidstone was suffering from a severe epidemic; and by his prompt and vigorous action he allayed public anxiety, and placed the Company on a firmer basis than before. Not only was the supply of water to the borough greatly improved, but it was extended to many of the outlying villages. The late Mr. Drake was highly respected in Maidstone, with which he was associated for forty years.

We regret to record the recent death, in his 64th year, of Mr. James Baynes, who was the Gas Examiner to the East Hull Gas Company for upwards of thirty years, and filled a similar position in connection with a number of other gas companies in the East and North Ridings of York as also in Lincolnshire. He was the Public Analyst to the Hull Corporation, the East Riding County Council, and several local authorities. At the funeral, the East Hull Gas Company were represented by their General Manager and Engineer (Mr. John Holliday) and the Secretary (Mr. David Wood). Deceased leaves a widow and two daughters.

The death took place last week of Mr. William Bailey, Manager and Secretary of the Camborne Gas Company. Mr. Bailey was a man of a versatile character and exceedingly busy life. He was for many years the chief stationer and printer at Camborne. He was also an auctioneer and valuer, and combined with the latter part of his business the duties of assessor for one of the leading insurance companies in an area which included Cornwall, Devon, Somerset, and Dorset. His active business connections extended from Penzance to Plymouth; but amid it all he found time to attend to the affairs of the Camborne Gas Company in a manner which won the esteem of the Directors, who at the annual meeting last Friday reported with deep regret that Mr. Bailey had died, and bore testimony to his ability and good services. The shareholders endorsed this opinion, and passed a vote of condolence with the widow and family.

An Improved Meter-Card.

One of the things in respect of which an Englishman, if a gas consumer, is prone to exercise his privilege of grumbling, is the amount of his gas bill. He has his doubts about the accuracy of the registration of his meter, and he regards with a certain amount of suspicion the entries made from time to time upon a somewhat grimy card which usually hangs near the meter—often in close proximity to, if not actually in, the coal cellar. It is in vain that the collector points to the instructions given upon the card for reading the meter index, as possibly they have become almost illegible. An attempt has now been made by the Caxton Press, Limited, of Furnival Street, E.C., to make the meter-card both useful and instructive. They have produced a stout double card (10 in. by 6 in.), opening endwise, and taped for hanging. The outer pages are coloured, the inner ones white. The upper portion of the first page is devoted to instructions, with diagrams, as to reading the meter; the lower part and the second page affording space for bringing under the notice of the consumer the advantages of gas for culinary and heating purposes, and giving him hints as to the proper use of the various appliances employed. The third page is reserved for entering the quantities of gas consumed; and it is ruled in the usual way. The last page is available for setting out the company's special terms, regulations, discounts, or any similar information. The advantages of this new card are that the records of the meter registrations, being covered, are kept clean, and that ample space is afforded for what may be called "advertisement." We have received a specimen of the card, and have no hesitation in commending it to our readers' attention as being far superior to the one it has been designed to replace.

Earl Cadogan, in his capacity of President of the Roads Improvement Association (Incorporated), has addressed a circular-letter to the road authorities of Great Britain asking them for certain statistics respecting what has been done to deal with the dust problem. This information is specially required for the International Road Congress, convened by the French Government, which is to be held in Paris next October, and in which the Association are taking a very active interest. A form has been circulated asking for a return of the length, area, and cost of the roads laid with dustless road material, treated with a surface coating of tar, and treated with other palliatives. Information is sought as to the comparative cost, results, notes of efficiency, &c.

WHAT DOES THE ADMISSION OF STEAM IN VERTICAL RETORTS COST?

This question is discussed by Herr Kobbert, the Manager of the Königsberg Gas-Works, in the last number to hand of the "Journal für Gasbeleuchtung." He takes as the basis for his discussion of the matter the figures given by Herr Prenger as to the working of the Bueb vertical retorts at the Cologne Gas-Works.* He attacks the problem from the standpoint of the cost of water-gas production in the carbonizing chambers as compared with its cost in independent water-gas generators.

At the Cologne works 11,931 cubic feet of gas were obtained in vertical retorts per ton of coal without admission of steam, and coke amounting to 72·74 parts per 100 parts of the weight of coal carbonized was produced, of which 15·60 parts were consumed in heating the retorts. The charge was worked off in ten hours. On the other hand, when steam was admitted the last two out of eleven hours devoted to working-off the charge, the make of gas per ton of coal was 13,618 cubic feet, and only 71·87 parts per cent. of coke were produced, of which 17·23 parts were consumed in heating. The gross calorific value of the gas made without steam was 575·4 B.Th.U. per cubic foot; that of the gas made with admission of steam was 547·3 B.Th.U. per cubic foot. Thus the introduction of steam resulted in the make of gas being increased by 1687 cubic feet per ton; and, by inference, the gross calorific value of this extra gas was 352·5 B.Th.U. per cubic foot. In the year 1904, however, a large number of determinations of the calorific value of water gas gave a mean of 327 B.Th.U. per cubic foot. The difference—that is to say, 25·5 B.Th.U.—is the gain which is attributable to carbonization in the eleventh hour, as the trials without admission of steam were limited to ten hours carbonizing time.

But even if this gain is credited to the steam, the equivalent quantity of water gas of 327 B.Th.U. calorific value is 1770 cubic feet per ton of coal. There is at the same time a loss of coke of 1·63 per cent. in the furnace fuel and 0·87 per cent. in reduced yield; making together a loss of 2·50 per cent. of the weight of coal carbonized. On this basis, a ton of coke yields 70,906 cubic feet of water gas. The proportion of water-gas in the mixed gas is 13·17 per cent. If the gain referred to is not credited to the water gas produced through the admission of steam, the yield of water gas per ton of coke amounts to only 68,252 cubic feet. When, however, steam was admitted from the eighth to the tenth hour of a ten hours' carbonizing time, the yield of water gas amounted to 13,069 — 11,931 = 1138 cubic feet per ton of coal, and its calorific power would be 335·6 B.Th.U. per cubic foot. The coke obtained was 71·30 per cent. of the weight of coal, or 1·44 parts less than when the coal was carbonized without admission of steam; while the coke used for heating rose by 1·68 parts —making the total consumption 3·12 parts for the water gas made. This is equivalent to a make of 38,676 cubic feet of water gas per ton of coke. The calorific value of the water gas is in close agreement with that found for water gas made in ordinary generators. Hence it still appears that the eleventh hour of gas making secures a gain of 25½ B.Th.U. from other sources than the water gas. The coke produced when gas making was continued for eleven hours contained 75·58 per cent. of carbon. When gas-making was stopped at ten hours, it contained 73·26 per cent. of carbon. From these figures it may be calculated that the yield of water gas per ton of carbon amounted to 90,244 and 53,843 cubic feet respectively.

These results, it must be remembered, were obtained in fifty-hour trial runs, and the modern water-gas generator in similar trials would give a make of 78,110 cubic feet per ton of coke with coke containing 81·87 per cent. of carbon. This is equivalent to a yield of 95,360 cubic feet per ton of carbon. In continuous working for a whole year, and taking into account all losses due to interruptions, clinkering, &c., this figure would be reduced to about 75,835 cubic feet on the average, and at the lowest would be 68,250 cubic feet. These figures lead to the conclusion: (1) That the admission of steam in the ninth to the eleventh hour of an eleven-hours' carbonizing period is attended by approximately the same efficiency in regard to water-gas production as is attained in a proper water-gas generator; (2) that the admission of steam in the eighth to the tenth hour of a ten-hours' carbonizing period affords not quite 6-10ths of the make of water gas which would be attained in a proper water-gas generator. Thus it appears that the simultaneous carrying-on of carbonization and water-gas production is uneconomical. As there is no advantage in carrying out the water-gas process in the retorts, it is a question whether this defect does not outweigh whatever other advantages there may be.

It must not be assumed that the production of water gas in the retorts is free from working charges—for instance, the generating plant is not saved. As it is not economical to make the coal gas and water gas simultaneously, the retort will for at least one hour become a water-gas generator pure and simple. With eleven-hour charges, 18·34 retorts out of an installation of 240 retorts would be exclusively engaged in making water gas, of which the make per hour would be about 17,660 cubic feet. The proportion

* See "Journal," Vol. CII., p. 562.

of the total labour required for working the plant of 240 retorts which would correspond with this make of gas would be about three one-man shifts per twenty-four hours. The cost of installation of these 18·34 retorts would, on the basis of the cost of the whole installation of 240 retorts, be—

For the settings themselves	£2751
For other equipment, coal and coke conveyors, chimneys, buildings, and foundations.	3004
Total	£5755

Taking interest on this capital expenditure at the rate of 4 per cent., and depreciation of the settings at 10 per cent., and of the remaining plant at 7 per cent., wear and tear at 0·475d. per 1000 cubic feet of gas made, and wages at 4s. per man per shift, the total charges for all the water gas made in the retorts amount to £1048, or to 2·65d. per 1000 cubic feet of water gas made. The well-known advantages of the water-gas generator—such as the great flexibility of production, the ready control of quality, &c.—are not secured, and the proportion of water gas in the mixed gas is at the most only about 13 per cent.

For the capital expenditure of the £5755 named, at least one generating plant, with all its accessories and with carburetting equipment for a production of at least 35,000 cubic feet of water gas per hour, could be provided, which, working for 220 days of 22 hours per annum, would give a total make of water gas which, added to the coal gas made in the 240 vertical retorts, would give a mixed gas containing about 19 per cent. of water gas, which is quite an admissible proportion. Allowing interest on the capital expenditure at the same rate of 4 per cent., depreciation at 8 per cent., wear and tear at the very high figure of £60, wages, again at 4s. per man per shift, and £12 for additional help, the total charges amount to £900, or to 1·26d. per 1000 cubic feet of water gas made. Even if these total charges are spread over the reduced make of water gas, which is equivalent to a proportion of 13 per cent. of the mixed gas, they amount to 2·28d. per 1000 cubic feet. This covers provision for a very great reserve productive capacity which is not afforded by the retort plant. No account has been taken of the power required by the retort plant; but even if an addition of ½d. per 1000 cubic feet is made for the fans, &c., of the water-gas plant, the figures of the cost of water gas are only raised to 1·6d. or 2·62d. respectively per 1000 cubic feet.

The conclusion to be drawn from the foregoing considerations is that, at the present time, water gas made in vertical retorts is still dearer by about 64 per cent. (as 2·65 : 1·60) than water gas made in special generators.

THE VERTICAL RETORTS AT COLOGNE.

In the "Journal" for the 2nd of June, we gave some particulars in regard to the working of the installation of vertical retorts at the Ehrenfeld Gas-Works, Cologne, as furnished by Herr Prenger, the Engineer and Manager, in a paper presented to the Rhenish and Westphalian Association of Gas, Electricity, and Water Engineers. We learn from a correspondent, who recently spent a couple of days examining the installation, that it showed but few signs of wear. He found the number of cracks in the retorts and the bench very small indeed, which he regarded as most gratifying, considering that half the retorts were started in June last year and the remainder two months later. The retorts were working with good heats; and out of 180 which he saw discharged, only one "hung-up." All the charges were thoroughly burnt off. No change has been made in the number of men. The mechanism for opening and closing the bottom doors appeared to work quickly and remarkably well; but, in spite of the fact that the eccentrics were tightened after each round, the leakage at the bottom doors was somewhat excessive. After being discharged into the movable hopper, the coke automatically disappeared into the De Brouwer conveyor. Steam and smoke on the discharging floor were conspicuous by their absence. The charging of the retorts was simplicity itself. The introduction of the small coke to protect the bottom mouthpiece did not present any difficulty. The average time taken to discharge, add the necessary coke, and charge the retort with coal, was not more than one minute, even when the workmen were taking things comfortably. The hydraulic mains and gas exit-pipes are now cleaned every four days. The retorts must be regularly scurfed every month, or a little oftener, if necessary; otherwise the coke will hang-up in the top part of the retort. Twelve-hour charges are being worked at present; the retorts being steamed the last two hours. The coke is much harder and heavier than that from horizontal or inclined retorts, and very nearly approaches coke-oven coke. The water-cooled fire-bars which are used for clinkering the producers have been in use for twelve months; and we learn that they show no signs of wear. The spear bars of the same age, however, are not so perfect, but will still last some time. The latter are fixed alternately with the water-cooled bars during the clinkering operation. Our correspondent adds: "The installation works very smoothly indeed; and the absence of noise, steam, and smoke is a credit to the Engineer. The coal and coke handling plant worked well; and, though elaborate, it appears to give very little trouble."

IRISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Holywood.

[From Our Own Correspondent.]

On Tuesday last, at Holywood, the Irish Association of Gas Managers carried through their annual meeting, under the presidency of Mr. T. Frizelle, of that town. In forming an estimate of the doings and the capabilities of the Irish Association it is well not to be misled, by the oft-repeated remark that they are mostly managers of small gas-works, into concluding that gas managers in Ireland, as a body, are less worthy than their brethren on this side of the water. The business they transact at their annual meetings, and the works visited in the various towns in which the meetings are held, disclose a capability for work which is quite up to the standard. If regard were had to the works visited at Holywood last Tuesday, the conclusion would be irresistible that they were far above the standard. Works more up-to-date for the business required of them, or works more sedulously maintained in condition, it is impossible to conceive. In this matter of the condition of gas-works in Ireland, there is the assurance of the Hon. Secretary—Mr. James Whimster, J.P., of Armagh—that there has been an immense improvement since the Association was formed. This is a gratifying fact; and it is equally gratifying to realize that the great improvement has been contemporaneous with the rise and progress of the Association, which, the President mentioned has advanced, in twelve years, from a membership of 46 to a membership of 117. It cannot be doubted for a moment that the presence of the Association has had much to do with the advancement generally of knowledge and practice in gas matters; but is the general prosperity of the industry not partly accountable for the existing state of affairs? The President mentioned that, excluding the three large works in Dublin, Belfast, and Cork, there had been an increase, in ten years, of over 16,000 consumers. The increase does not appear to be large; but the percentage—77½—is, which, again, is due to the small number of consumers in Ireland, compared with the population. Out of a population of 4,400,000 there are only 121,000 gas consumers returned; while in Scotland, with an almost similar population, there are 570,000 consumers. This points to the leeway which has to be made up in Ireland; and also, by inference, to the grand field which there is for Irish Gas Managers to cultivate. That Irish Gas Managers are alive to the particular vocation which lies readiest to their hand is brought home by a retrospect of the proceedings of the Association. The subjects chosen for discussion, and the subjects which arouse the greatest interest, are almost altogether on the commercial side of the industry. Managers seem instinctively to realize that it is not so much by improved methods of manufacture that they are to flourish, as by the bringing in of more customers; and the figures given above point to the rectitude of that conclusion.

The President, in his excellent address, emphasized this view of the situation. In matters technical, he largely confined himself to urging attention to details. His own experiences, which were given at considerable length, were a forcible illustration of the value of both branches of advice. By business enterprise, he has succeeded in trebling the output of gas in twelve years, and reducing the price of it from 5s. 10d. to 3s. 9d.; and by close attention to working, he has been able to make the business pay. His figures as to the results obtained are very instructive, and bear out fully the value of attention to small matters.

In the paper by Mr. J. F. Tyndall, of Wicklow, on "Methods of Charging for Gas," there was a further manifolding of the importance of attending to the commercial side of the industry. Differential prices as practised were the target he tilted at. He seems to have unduly magnified the effects of differential prices, as culled from a return which gives no explanation as to reasons. The instance he named of a differential rate of 4s. per 1000 cubic feet, was certainly fair game to shoot at, and even the explanation

given of the case by Mr. R. Bruce Anderson is not sufficiently convincing to justify it. To do the author justice, he does not altogether condemn differential prices, but in practice gives a differential rate, beginning with 9d. and now reduced, as the effect of increased consumption, to 6d. per 1000 cubic feet. The soundness of the policy which fixes the lower rate at a figure which will give some return for capital charges, and use the profits to reduce the higher rate, cannot be controverted. But that surely does not exhaust the case for differential prices; for, it being impossible to establish a hard-and-fast rule, is it not admissible, in cases where a branch of industry might be gained, or a branch prevented from being lost, to effect the purpose by a concession which, for a time, would not pay, but which, in time, would yield a fair if not a handsome return? This is tantamount to saying that in the matter of differential prices, as in so many other branches of business, every case must be ruled by its own circumstances. The paper by Mr. J. Brodie, of Lisburn, upon the distribution department, was still on the commercial side, and embodied a number of useful observations.

The lecture by Dr. Harold G. Colman was a production which cannot be praised too highly. It was a most appropriate subject for his hearers, giving them information as to what goes on inside the hydraulic main in a way and to a degree some of them had possibly not realized before. Lectures by eminent scientists are a feature of the Irish Association meetings; and the lecture this year was one of the most suitable members have ever listened to.

The meeting altogether, with the excursion the following day, was of the most pleasant and instructive character.

The Annual Meeting of the Irish Association of Gas Managers was held on Tuesday last in the Town Hall, Holywood, near Belfast. Mr. T. FRIZELLE, of Holywood, presided over a good attendance of members.

WELCOME FROM THE GAS COMPANY.

Dr. D. JOHNSTON, a Director of the Holywood Gas Company, said he had been deputed by his brother Directors to come there and give the members a hearty welcome to the town. He expressed the wish that their meeting would be a happy and profitable one.

APOLOGIES FOR ABSENCE.

Apologies for absence were intimated from Mr. Thomas Glover, of Norwich, President of the Institution of Gas Engineers; Mr. T. J. Reid, of Ballina, the Past-President of the Irish Association, who was detained by a severe cold; Mr. B. Mitchell, of Portrush; and Mr. A. Mackenzie, of Edinburgh.

THE REPORT OF THE COMMITTEE.

The HON. SECRETARY (Mr. J. Whimster, J.P., of Armagh) presented the report of the Committee, which stated that they were pleased that they could congratulate the Association on the continued popularity of the annual meetings. On account of the meeting of the Institution of Gas Engineers, which was held in Dublin in June of last year, grave fears were expressed by some that their own meeting, two months later, might be a failure; but so far was this from being the case, that the attendance was almost a record one. Mr. Reid's presidential address, the papers by Mr. Byron, of Nenagh, and Mr. Roberts, of Newtownards, dealing with slot consumers and water gas, and the animated discussions thereon, made the meeting most instructive and enjoyable. The Committee expected that this year's meeting in Holywood would prove equally attractive. Besides two papers, they would have the privilege of a lecture on a subject of the highest importance to them all, by Dr. Harold G. Colman, of London—a familiar figure at the meetings of the Institution of Gas Engineers, and the value of whose research work in the field of gas chemistry was universally acknowledged.

The report of Mr. R. Bruce Anderson, their representative on the Council of the Institution of Gas Engineers, was appended as a separate document. Mr. T. J. Reid, of Ballina, had been duly elected as representative on the Council for the current year.

In February last, they lost, through death, another of their members, who always took the deepest interest in their work—Mr. P. Conroy, of Galway—the circumstances of whose death, following so shortly the loss of his wife and child, made it seem particularly sad; and the Committee sent a wreath in the name of the Association and a donation of £10 to help his orphaned children in their need. Another member passed away shortly before their last meeting in the person of Mr. Owen Owens, of Skibbereen; but the Committee were unaware of it till some months afterwards.

The abstract of accounts and the Auditor's report showed a balance to the credit of the Association of £59.

Mr. ANDERSON in his report stated:

I have completed my year of service as District Representative of our Association on the Council of the Institution of Gas Engineers, and beg to report as follows: In succession to Mr. Airth, I was placed upon the General Purposes Committee of the Council. No matter specially affecting our Association was dealt with during the year; but the Institution has dealt with the following subjects, among others—Amendment of Conference Act, to legalize payment of expenses of members, but with no definite result; International Photometry, with a view to arriving at a common denomination for comparison; Affiliation, with the result that all the old recognized Associations are now affiliated; Workmen's Compensation—a report on this matter was issued to each member of the Institution, giving suggestions as to insurance; Coal Mines (Eight Hours) Bill—the Institution joined a deputation which attended upon the Home Secretary, to point out to him the consequences to the gas industry if the Bill becomes law. Dealing as it does with matters affecting the gas industry at large, a year's experience of its inner working has deepened the feeling I have always had that it is to be regretted that the comprehensive title "Gas Institute" was not maintained, so that by name as well as by intention it should be representative of our whole industry.

The Auditor's report, presented by Mr. G. W. NORMAN, of Dublin, stated that the income of the Association for the past year amounted to £102. It was, he said, the first time he had to report a decrease; but the circumstances were exceptional.

The PRESIDENT moved that the reports be adopted.

Mr. R. HARRISON (Monaghan) seconded; and the motion was agreed to.

NEW MEMBERS.

The following new members were admitted to the Association:

Ordinary Member.—Whimster, J. W., of the South Suburban Gas Company, London.

Extraordinary Members.—Scott, J. O., of Edinburgh; Allan, R., of Edinburgh; Mahood, W., of Glasgow; Russell, W. F., of Glasgow; Russell, W. R., of Glasgow; Beck, J., of Belfast.

ELECTION OF OFFICE BEARERS.

The HON. SECRETARY reported that the Committee had adopted a resolution to the effect that, by way of experiment, the Secretary should next year issue sheets to all the ordinary members, whereon to suggest names for all the vacant offices, which would be nominated at the annual meeting, and the vacancies would be filled up from those nominated. This resolution had been adopted by the Committee as the best way to get over the unwillingness of members in the meeting to make nominations, and its being forced on the Committee to nominate.

Mr. J. G. TOOMS (Waterford) congratulated the Committee on the action they had taken. The only regret he had was that the action was not taken sooner. It was, he thought, a distinct step in the right direction.

The following were then elected:

President.—Mr. F. Eustace, of Tullamore.

Vice-President.—Mr. R. Harrison, of Monaghan.

Members of Council.—Messrs. F. T. Cotton, of Dublin; B. Gibson, of Newry; and J. Paterson, of Queenstown.

Hon. Secretary and Treasurer.—Mr. J. Whimster, of Armagh.

Auditor.—Mr. G. W. Norman, of Dublin.

NEXT PLACE OF MEETING.

Mr. EUSTACE (Tullamore) returned thanks for the honour the members had conferred upon him. He moved that the meeting next year be held in Dublin; and this was agreed to.

REPRESENTATIVE ON THE COUNCIL OF THE INSTITUTION.

The PRESIDENT said it had been the custom to appoint the outgoing President as their representative on the Council of the Institution of Gas Engineers, but as he had, on account of having been busy, delayed the sending in of his application for membership of the Institution, the question had been raised whether he would be eligible for the office.

After a discussion, it was agreed that the President be appointed, whom failing, Mr. Eustace.

THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered his address, which was given in the "JOURNAL" last week (p. 387).

The HON. SECRETARY asked the meeting to accord to the President a hearty vote of thanks for his very able and timely address. It was one which particularly appealed to the managers of small works, which they all were. The President had spoken of the good the Association had done to small gas-works. He would like to emphasize this, for he was perfectly satisfied that the Association had been of immense benefit to the owners of small works all over Ireland; and he thought it would be well if, by some means or other, the owners of all these works could be got to appreciate the fact, and show their appreciation of it by paying the expenses of their representatives to the meetings. It was for their benefit if managers came there and got wrinkles which helped them in every detail of their work. One thing struck him in the address, and that was the remarkable success which the President had achieved in Holywood. It made him envious to learn that he sold 5000 cubic feet of gas per head of the population. This was something marvellous. If many of them got near to that, their makes would be a good deal bigger than they were. The President had no factories to help him. Whether factories were a help was a moot point, because their demand came on with a rush. But the President had a fine residential district—big houses, occupied by men with plenty of

money, who could afford to burn gas, and to pay for it. He thought they ought to congratulate the President on the success he had achieved.

Mr. F. EUSTACE seconded. The address had been a very instructive one, and would benefit the whole of them—especially the managers of small works.

The motion was adopted.

PRESENTATION OF THE PRESIDENT'S MEDAL.

Mr. R. BRUCE ANDERSON (Westminster) said that on account of the inability of Mr. Reid to be present, the pleasant duty had fallen to him of presenting the medal which it had been customary for them for some years to give to the President as a mark of their appreciation of his services. When he saw the size of the place, the question occurred to him where the President could dispose of all his gas. It had been explained to them that day. Those who were over the gas-works that day must have been struck with the way in which the whole thing was carried on for economy and efficiency. He paid attention to small as well as to big things.

The PRESIDENT, in returning thanks, said the matter had been put before them too brightly; but if his address, or anything he had said, should be the means of encouraging the managers of small works to look into methods of working, he should be very pleased. In his work he had the support of his Directors, who were progressive gentlemen; and therefore they had as much cause for thankfulness at the results obtained in the gas-works as he had.

READING OF PAPERS.

The reading of papers was then proceeded with. Mr. J. F. Tyndall, of Wicklow, read a paper on "Methods of Charging for Gas" (see p. 455); and Mr. J. Brodie, of Lisburn, one entitled "Some Observations on the Distribution Department." The latter, with the discussion thereon, will be given next week. A lecture, on "The Effect on Practical Working of the Seals and Pressures in the Hydraulic Main and Retort," was delivered by Dr. Harold G. Colman, of London; and it appears elsewhere to-day, p. 453.

At the close of the lecture,

Mr. R. BRUCE ANDERSON proposed a hearty vote of thanks to him. He was sure they would all go back to their works and be trying no end of experiments, in an endeavour to obtain those results, which, it was shown them, were all obtainable by attention to the hydraulic main. He had touched upon a number of most interesting points, in some of which they had been endeavouring, but had not attained, success. He had called attention to the serrated dip-pipe, and had given the reason for this arrangement having been abolished. He had told them that it was never known what the depth of seal was, with the serrations, and that, to get rid of this difficulty, they had introduced square serrations. The discussion of a lecture, however, was not a thing to be thought of; so he would simply ask them to pass the vote of thanks that he proposed to Dr. Colman for his admirable lecture.

The HON. SECRETARY, in seconding the vote, said that when he asked Dr. Colman to deliver a lecture, he asked him to give them something which would be useful to men in small works. He had certainly taken up a subject which was of the deepest interest to every gas manager in Ireland. In his lecture, he referred to the work of the late Mr. William Young, of Peebles, thirty-one years ago; and Mr. Blair, of Helensburgh, said something at the luncheon about the subjects which were being discussed to-day being the same as those which were discussed in his youth. He himself knew that the subject before them was rampant in Scotland forty years ago; and he had the pleasure of saying that his father took a leading part in the discussions. His father got over the difficulty in another way, which he would try to describe to them. From the end of the hydraulic main he took a down-pipe of 4 inches diameter, and an up-pipe of the same size. They joined in a T, and further off he had a weir-valve, by which he regulated the seal. After he had adjusted the seal to his liking, he locked it, and he had a constant flow of tar and liquor going in at one end and out at the other. After this he had no trouble with choked ascension pipes or pitched mains, although before that he had been worried to death by such troubles. These subjects were recurring to-day; and they all felt the difficulties, more or less, of stopped ascension pipes and pitched hydraulic mains. It was a practical subject which Dr. Colman had chosen for them. He would have liked if someone had given them a description of the retort-house governor. He must confess to a good deal of ignorance about it. He really did not know how it acted. It occurred to him that it would not be out of place to ask Dr. Colman to become an Honorary Member of the Association. Their departed friends, Professor Ivison Macadam and Dr. Tichborne, were both Honorary Members.

The vote of thanks was cordially accorded, and Dr. Colman was, by acclamation, elected an Honorary Member, the PRESIDENT remarking that Dr. Colman had opened up the hydraulic main to them, and let them see, in a picturesque way, what went on inside it.

Dr. COLMAN, in returning thanks, said it always was a great pleasure to him to attend gas meetings. Belonging to the gas industry, he felt it a great pleasure to go to any meeting of this sort, for, after all, they were all pulling together towards one end. They all wanted to get the best results they could. Some of them started from the chemical side, some from the working side, and some from the commercial side; but they were all pulling together, and anything which he could do to assist them in pulling together he would be only too pleased to do. He thanked them very heartily for the honour they had done him; and he fully accepted it. He hoped, as an Honorary Member, he would be able to do something to assist the Irish Association, as well as the gas industry generally.

CLOSE OF THE MEETING.

Mr. G. AIRTH (Dundalk) proposed a hearty vote of thanks to the President for the able manner in which he had conducted the meeting. They all knew Mr. Frizelle; and he had acted in the chair in the way they had expected he would do.

Mr. J. G. TOOMS, in seconding, said Mr. Frizelle's occupancy of the chair had been no more than they had expected of him; and yet, although they expected great things of the President, he thought that Mr. Frizelle had excelled himself.

Mr. J. E. ENRIGHT (Tralee) said that Mr. Tooms had anticipated him. He had come 325 miles to attend the meeting; and he thought it had been well worth the trouble.

The PRESIDENT, in returning thanks, said that if anything he had said should be the means of furthering the cause they had at heart, in any shape or form, he would feel that he had not held office in vain.

Mr. TOOMS proposed a vote of thanks to the Committee and the Hon. Secretary, who, along with the President, had conducted the affairs of the Association so creditably during the past twelve months.

The HON. SECRETARY thought they should not separate without passing a formal vote of thanks to the Chairman and the Directors of the Holywood Gas Company, for their kindness to them that day.

Mr. ENRIGHT having seconded, both proposals were agreed to.

The proceedings were concluded shortly after six in the evening. Before returning to Belfast, which nearly all the members did, most of them paid a visit to the gas-works, which were found to be skilfully laid out and scrupulously tidy. The visitors were hospitably entertained by Mr. and Mrs. Frizelle.

THE LUNCHEON.

During the day the proceedings were interrupted to enable the members and lady friends to partake of luncheon, provided by the Directors of the Holywood Gas Company, and served in the Town Hall Buildings. Mr. A. D. LEMON, J.P., the Chairman of Directors, presided, and proposed the toast of "The Irish Association of Gas Managers." The PRESIDENT and HON. SECRETARY acknowledged. "The Directors of the Holywood Gas Company" was proposed by the HON. SECRETARY. To the toast of "The Visitors," proposed by the Chairman, Mr. W. BLAIR, of Helensburgh, responded. The company numbered about ninety.

THE EXCURSION—A PRESENTATION.

On Wednesday, a party of seventy ladies and gentlemen went on an excursion from Belfast to the Giants Causeway and back. The weather being favourable, a very pleasant day was spent. At the close of the luncheon in the Causeway Hotel, Mr. G. W. Norman, in the name of the company, presented Mrs. Frizelle with a gold Tara brooch, as a token of the esteem of the members for the way in which she had entertained them the previous day. On returning to Belfast, "Auld Lang Syne" was sung on the platform of York Road Railway Station, after which the party, with hearty hand-shaking, took their several ways.

DUTCH ASSOCIATION OF GAS ENGINEERS.

Annual Meeting at Breda.

The last number to hand of "Het Gas" gives a report of the proceedings at the thirty-sixth annual meeting of the Dutch Association of Gas Engineers at Breda on the 7th to 9th of July last. The Mayor of Breda, Heer A. P. SCHELTUS, welcomed the members of the Association at a reception on the evening of Tuesday, the 7th ult. The President of the Association, Heer J. Blom, of Haarlem, referred to the fatal accident (reported in last week's "JOURNAL") at the Sliedrecht Gas-Works, of which some further particulars are given below. He also spoke of the participation by Dr. Terneden, of Amsterdam, in the meeting last year of the International Photometric Committee at Zurich, and to the appointment of Heer G. A. Brender à Brandis, of the Hague, as Lecturer on the gas industry at the Technical College at Delft. He stated also that the Council had petitioned the Queen of the Netherlands in regard to facilities being granted for winning gas coals from the coalfields of South Limburg. He then referred to the visit of the members of the Association to the Cologne Gas-Works, at the invitation of Herr Prenger, on the 1st and 2nd of February last.

During the year the Association had borne the cost of publishing a third edition of the pamphlet on sulphate of ammonia prepared by Heer A. A. ter Haar, Lecturer on Agriculture at Goes. Allusion was made to the construction of a third gas-works at Amsterdam, to the projected third works at Rotterdam, and to schemes for the extension of the works at Utrecht and Groningen, as well as to the completion of numerous small new gas-works, as, for instance, those at Lisse, Hattem, Heemstede, Medemblik, Scboten, Oisterwijk, Groenlo, &c. The speaker went on to mention the

general uneasiness which prevailed, the increase in the price of gas coals, and the decline in the value of coal tar consequent on the large output of coke-ovens, and of the union of the tar-distilling firms. In this connection mention was made of a process devised by Rincker and Wolter for the complete gasification of coal and water gas tar and petroleum residues. The process has been adopted at the Utrecht Gas-Works. The Photometric Committee of the Association reported that it had examined various London argand burners with regulated air supply. The Committee had also made some investigations on the correlation between the chemical action and the optical effect of the rays from different sources of light. The Coal Commission of the Association reported that it had given advice on 34 questions relating to the purchase of gas coals, and that it had published a monthly report in "Het Gas" on the prices prevailing in the English coal market. In January it sent a circular to the managers of gas-works asking for information as to the descriptions of coals carbonized in 1907, and of the quantities of coke, tar, and liquor produced. A question as to the desirability of issuing a printed report yearly on the gas coals used in the Netherlands was decided in the negative. The matter of the fixing of standard clauses for coal and gas oil contracts was considered by the Committee, who reported that preliminary steps towards an international understanding have been taken in Germany, France, England, and Belgium, but that before standards could be fixed for gas oils a Special Committee would be required to inquire into the matter. A Committee for this purpose, with Heer J. A. Bakhuis, of The Hague, as Chairman, was thereupon appointed.

The membership of the Association had increased since last year by 11; making a total at the present time of 397. The following officers were elected for the ensuing year: Heer J. E. H. Bakhuis, of The Hague, as President; Heer J. Blom, of Haarlem, as Vice-President; Heer N. W. van Doesburgh, of Leyden, as Secretary; and Heer J. W. van Rossum du Chattel, of Amsterdam, as member of the Council. Heer C. T. Salomons, of Rotterdam, was chosen as Editor of "Het Gas;" and Heer J. W. van Oostrom Meyjes, of Deventer, was elected a member of the Committee for the Administration of the Benevolent Fund. The report of the Treasurer, Heer J. Bauduin, of Maastricht, showed that in the year 1907 the funds of the Association had been reduced by about 400 florins in consequence of the expense involved in preparing a guide for gas-fitters and of holding an extra meeting at The Hague during September last year, in addition to the usual meeting in July. Grants were then made: (1) To defray the cost of the general meeting; (2) towards the editorial expenses of "Het Gas;" (3) towards the cost of compiling statistics on the working results of Dutch gas-works in the present year; and (4) towards granting awards for investigations by members of the Association calculated to further the interests of the gas industry. Utrecht was chosen as the place for the holding of next year's meeting.

The following technical communications were made to the meeting: By Heer F. W. Payens, of Breda, on the evolution and present position of the Breda Corporation Gas-Works; by the same author, on an anti-vibrator for inverted gas-lights for street lamps; by Heer G. Daams, of Almelo, on the Eitle charging and drawing machines which have been in use at the new gas-works at Almelo; by Herr F. Lux, of Ludwigshafen, on Bauduin's distance pressure indicator; and by Heer P. der Liefde, of Culemburg, on the accident which occurred on July 2 at the Sliedrecht Gas-Works.

The accident referred to in the last communication occurred in a small gasholder of 400 cubic metres (14,000 cubic feet) capacity of which the tank guides and rollers were under repair. The manhole in the holder had been opened and the tank partly pumped out. A staging fastened to the rafters of the crown of the bell had been erected in the holder. On the Tuesday and Wednesday men had worked in the holder by candle light; but in consequence of high temperature, work had been suspended on the Thursday morning and was only resumed in the evening. Twenty minutes after the resumption of work, the Manager of the works, Heer W. van Hoeve, arrived and found that only two out of the four workmen engaged in the holder were visible; and they were lying unconscious on the staging. He succeeded, with the aid of his son, in lifting them through the manhole, but was then himself overcome; and his son, being unable to lift him through the manhole, left him lying on the staging. The son with all speed made an opening over the staging; but meantime Heer van Hoeve senior fell off the staging and was drowned, as the two workmen had been. The probable cause of the men being rendered unconscious was the liberation of gases from the water contained in the tank consequent on the rise in temperature, and the accumulation of these gases beneath the bell. Perhaps a fall of the barometer may have contributed to the gases being given off.

A discussion took place as to the minimum annual make for which a gas-works could advantageously introduce a water-gas plant; but it was found impossible to arrive at any definite figure, as the problem must be largely determined by local conditions—such as large increase or variation in the consumption of gas, the necessity for keeping down capital expenditure, the market for coke, &c. It was mentioned that the establishment of carburetted water-gas plant at Leeuwarden in 1905 had as a consequence the stoppage of projected work for the extension of the coal-gas plant. Some discussion followed on the question of why bog oxide of the same composition should behave better in one gas-works than in another; and it was concluded that its behaviour was affected by the amount of ammonia in the crude gas and the state of granulation of the material. One speaker quoted figures showing that bog oxide delivered by different firms from 1901 to 1907 contained only a small percentage of oxide of iron. Another matter discussed was the action of gas oils on the fire-brick filling of the carburettors of water-gas plant; and it was agreed that the oils which left much residue had the most prejudicial effect on the fire-brick. A discussion ensued on the rapid corrosion of iron by salt water; and it was agreed that gasholder tanks ought to be filled as far as possible with clean water. The purity of the gas, however, was also thought to have its effect on the water in the tank, and to cause the latter to act injuriously on the iron plates. Cyanogen, which is especially harmful, falls to the bottom of the water in which it is absorbed; and thus its injurious action may be avoided by pumping off the water from the bottom of the tank from time to time, and filling up with fresh water at the top. This point led on to the consideration of the failure of the material of a gasholder at Amersfoort, of which the cause was believed to be the bad quality of the iron, though on this point there was some difference of opinion.

It was reported that the Amsterdam Gas-Works had effected a considerable saving in the number of mantles used for public lighting by adopting the copper cellulose Cerofirm mantles, also by increasing the pressure at which the mantles were burnt off from about 7 to 9½ inches. The illuminating power, though somewhat less than that of the ordinary commercial mantles, remained very constant. It was reported by the Managers of the gas-works at Almelo, Leyden, Utrecht, Haarlem, and Flushing, that inverted incandescent lamps had been adopted for street lighting in their towns. The fracture of the mantles was not excessive as compared with ordinary incandescent burners. There was, however, the disadvantage that the products of combustion struck the burners and quickly acted injuriously on them. This harmful action was reported to be avoided in an inverted burner made by the Laddite Mantle Company. The Bauduin automatic lighting and extinguishing device for street lamps was reported to have answered well in some five towns in Holland, and to be now on trial in a number of other places. At Flushing, Dr. Rostin's automatic apparatus had been attached to all the lamps, and had given satisfaction. It was, however, considerably more costly than the Bauduin device. Some clockwork appliances for the lighting and extinguishing of lamps were exhibited in the room in which the meeting was held. A discussion then arose on the modification of coin-freed prepayment meters so as to adapt them for the reception of coins of different sizes and denomination; the conclusion being arrived at that the coin-freed meters so far used in Holland had proved durable and not costly in respect of repairs. A Fahrenheim's registering gas-calorimeter was exhibited in the meeting room, and was studied with interest.

There were various excursions and festivities arranged in connection with the meeting. On the Wednesday, local objects of interest were visited, and the members dined together at the Flora Hotel, at Ginneken; a concert being given in the evening in the Concordia rooms. On Thursday, the Breda Gas-Works were visited, and an excursion was made through some of the forest scenery in the neighbourhood to the Duivelsburg Hotel. In the evening the proceedings concluded with a banquet. The meeting was attended by 160 members, including Herr C. T. Salomons, the Honorary Member of the Association.

Wood Preservation by Creosote Oil.

This subject has lately been dealt with in a "Bulletin" of the Bureau of Forestry of the United States Department of Agriculture. It is pointed out that one of the significant signs of the times is the awakening of the American people to the dangerous destruction of their forest wealth, and the necessity of a wise use of what remains of it; and it is remarked that in the future the nation will have to utilize its forest crop less wastefully, and make provision for other crops. This, however, is not the only way to prolong the timber supply. If the service of the wood can be lengthened, it will largely decrease the quantity of timber which must be cut. This can be done by treating the wood with chemicals that will poison the low forms of plant life which attack it and cause it to decay. One of these is creosote, of which there are several kinds; but emphasis is laid on the fact that the best is the creosote derived from the distillation of coal tar. It is explained that in this process the still is heated, and as the heat increases the light oils first pass over. Among these is the familiar carbolic acid—a powerful antiseptic, but undesirable as a wood preservative, as it evaporates too readily. When a temperature of about 400° Fahr. has been reached, the distillate is turned into another receiver; and from this point on to 600° or 700° creosote oil is produced. It is this substance which is the great wood preservative. Much study has been devoted by the United States Forest Service to creosote oil, to determine what its composition should be to give the best results in preserving timber under different conditions, and how the most desirable creosotes may be obtained. The reports of these studies, together with detailed description of the more economical processes of applying the preservatives to wood, have been embodied in circulars which the Government have placed at the disposal of users of timber.

CAPE TOWN AND ITS WATER-WORKS.

By R. O. Wynne-Roberts, M.Inst.C.E.

[Extracts from a Paper read before the Association of Water Engineers.]

With the title of a "History and Description of the Cape Town Water-Works," a lengthy account of the ancient and modern water supply arrangements at Cape Town, illustrated by some interesting photographs of old plans and records, was given at the recent meeting of the Association of Water Engineers; but we can only find space for some of the later history of the supply—commencing with thirty-and-odd years ago.

Molteno Reservoir.

A contract was entered into in 1877 with Mr. William James for the construction of this reservoir; the amount of the tender being £46,813.

The Molteno reservoir works were giving the Council considerable anxiety; effective supervision was lacking, defective work was not prevented, and economies were effected which caused instability, for although the works were inaugurated in 1881, a breach occurred in one of the earthen embankments the following year. This was a great disappointment and loss, and was the more serious owing to the fact that the population was now over 40,000, the consumption about 500,000 gallons per day, and a drought also prevailed.

Inasmuch as this reservoir was situated above some neighbouring houses, and as the geological formation was deemed to be somewhat treacherous owing to the pot clay foundation, some local engineers were called in to advise what had better be done. Fresh plans were prepared in 1883 by Mr. Charles J. Wood, who was especially engaged for the work; and during the following year, Messrs. Ball and Smart's tender was accepted. The work was ultimately completed in 1886, at a total cost (including land, legal expenses, &c.) of £98,297.

The dimensions of the reservoir at top-water level are as follows: Mean length, 1000 feet; width, 303 feet; depth, 45 feet; capacity when full, 50,000,000 gallons. The side and end slopes are pitched with local stone and coated with cement concrete. The floor is formed of cement concrete. The north and part of the east and west sides consist of massive earth embankments; the other sides being excavated in the mountain slope. The valve tower is situated at the east end, and consists of a brickwork shell, 8 feet in diameter, connected to a tunnel which extends through the embankment. The draw-off valves, which are operated in the usual manner, are connected to a vertical cast-iron standpipe, 2 ft. 6 in. in diameter, in the tower. The scour outlet is at the base of the valve tower, and, together with the 18-inch supply main, is laid on the floor of the tunnel.

The supply from all the springs and streams on the mountain slope which had now been acquired, averaging from 450,000 to 1,000,000 gallons per day, according to the season, as well as a portion of a supply from Table Mountain, flow into this reservoir and thence to the lower ones to meet the requirements of the different districts.

To those who had made a study of the problem of the water supply, it was evident that the Molteno reservoir did not offer a complete solution of the problem, but was only the nucleus of a comprehensive scheme.

Table Mountain Supply and Woodhead Tunnel.

A Bill promoted by the Table Mountain Water Supply Company in 1882 was approved by Parliament; the object being to construct works on Table Mountain for the supply of water to the suburbs and district. Funds were, however, not forthcoming, and the scheme lapsed.

Mr. J. G. Gamble, the Government Hydraulic Engineer, was engaged in 1875 and 1881 to report on the Table Mountain as a source of supply; and, acting on his advice, another Bill was promoted by the City Council in 1887, which received parliamentary sanction. A contract was subsequently made with Mr. Peter Selly to construct the Woodhead tunnel from Slaangoolie Gorge to the Houts Bay Stream (about 2000 feet long). This was completed in 1891. The pipe line, designed to convey 4 million gallons per day and nearly 5 miles in length, was constructed departmentally along the mountain slopes from the Molteno reservoir to and through the tunnel to an intake (1700 feet above sea level) in the stream. This main ranged from 6 inches in diameter, with an inclination of 1 in 1·37, to 16 inches in diameter, having a gradient of 1 in 104. The total cost of these works was £45,000. Break-pressure tanks were also constructed to reduce the hydraulic head. The work was executed under Mr. Cairncross (City Engineer) and Mr. Esden (Resident Engineer).

The difficulties met with in the construction of the Woodhead tunnel and pipe-line may be judged from the photograph fig. 2, which illustrates the steep and inaccessible nature of the slopes.

The water flows from the intake near the tunnel to Mocke and Kloof Nek, Sea Point, Molteno, and to the other service reservoirs.

Other more ambitious schemes for obtaining water outside the district—such as "The Twenty-four Rivers Scheme," 75 miles distant, estimated to cost £180,000, the Brede River Scheme, and the Berg River Scheme, 50 miles distant—were considered; but, on the advice of the Military, having regard to the possible strategic isolation of the city and suburbs in case of war, it was deemed desirable to first utilize the resources on Table Mountain before embarking on schemes outside the peninsula.

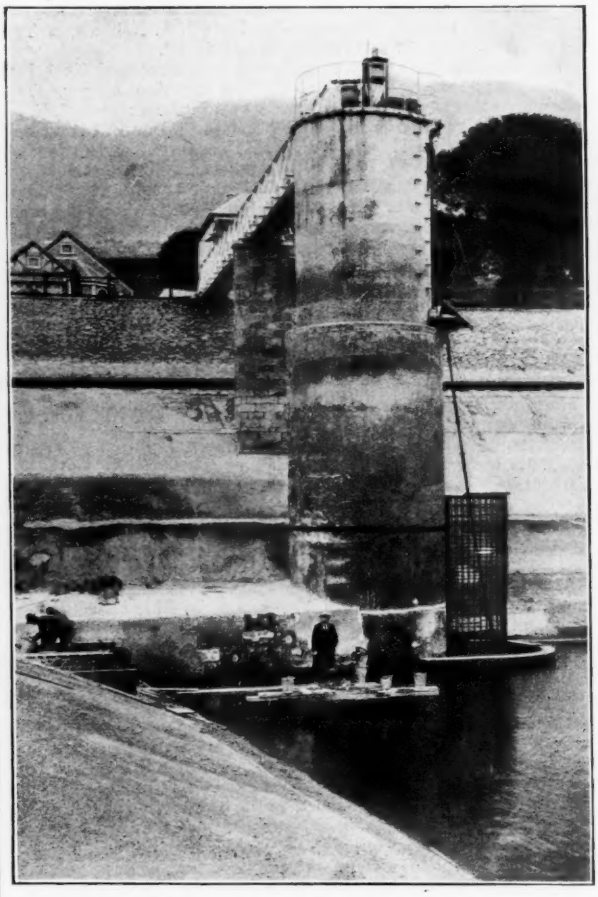

Fig. 1.—The Molteno Reservoir, showing the Valve Tower.

Woodhead Reservoir.

As the Houts Bay Stream was irregular in volume, it was necessary to construct a dam, for which purpose the ratepayers in 1891 sanctioned an expenditure of £50,000, and in 1892 Mr. Thomas Stewart, M.Inst.C.E., was appointed Engineer to carry out the work. He recommended a dam to impound 150 million gallons, which was larger than the one originally approved; but this was shortly afterwards increased to a capacity of 224 million gallons. The work was commenced in 1892 and completed in 1897; the total cost being £148,300.

The top-water level is 2404 feet above sea level, and the water surface area is 24⅛ acres. The maximum height of the wall is 143 ft. 8 in.; the maximum depth of water is 122 feet; and the dam is 803 ft. 6 in. long measured along the top. The centre portion for a length of 155 feet is built

Fig. 2.—Slaangoolie Gorge, Showing the Pipe-Track, &c.

curved in plan with the convex face up-stream and a radius of 250 feet. The thickness at the scour-pipe level is 63 feet and at the top 10 feet; the profile being as shown in fig. 3. The wall consists of cyclopean masonry laid in Portland cement mortar, with coursed rock facework front and back. All the stones for the hearting were rough-dressed so as to present flat beds, and were quarried at an adjacent outcrop of quartzitic sandstone. The work was carried out departmentally. This reservoir was named after the Mayor, who took a very active part in advocating its construction. A photograph of the completed dam and overflow weir (36 feet long) is given in fig. 4.

Owing to the height above sea-level, and to the great difficulty of access, an aërial ropeway was installed, commencing near Camps Bay, at a elevation of about 200 feet, and rising 2180 feet in a horizontal distance of 5290 feet. It had fourteen spans, the two longest being 1450 feet and 1360 feet respectively. The hauling rope was 12,200 feet long, and the carrying capacity of the fixed rope 1200 lbs., exclusive of the travelling cage. The hauling rope was operated by a semi-loco. engine stationed at the base, by means of a horizontal drumwheel carried on a sliding base which was counterweighted to take up the sag and expansion of the rope.

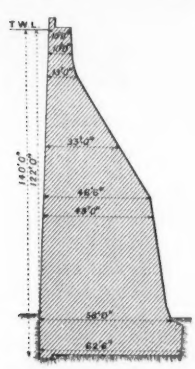

Fig. 3.—The Woodhead Dam.

This plant was constructed by Messrs. Bullivant, and was erected departmentally. A number of natives were stationed on the gantries during operations, to ensure the fixed wire resting on the pulleys, and the safe passage of the travelling cage; the irregular gradients of the ropeway causing the loaded cage to lift the wire at certain of the gantries. Telephonic communication was provided between the terminal stations. Accommodation, with proper sanitary arrangements and a good water supply, was provided for both whites and natives on the mountain near the works, outside the watershed; and as at times about 300 men were employed, this was very necessary.

The population supplied in 1897 was about 69,000, and the consumption some 1,390,000 gallons per day for all purposes—that is, 20 gallons per head per day.

Hely-Hutchinson Reservoir.

Even before the completion of the Woodhead dam it was thought necessary to consider further extensions; but definite steps were not taken for some time, although the matter was frequently discussed by the Council.

At the top end of their Woodhead reservoir there was a site for another dam which was practically the same as that recommended by Mr. Gamble in 1882. Instructions were ultimately given to Mr. Stewart to prepare plans for a second masonry embankment at this spot. The work was commenced in 1900 and finished in 1904, at a cost of about £200,000, and named "Hely-Hutchinson," after Sir Walter Hely-Hutchinson, the respected Governor of Cape Colony, who laid the last stone.

It is 1740 feet long; the centre portion being curved as in the Woodhead dam. The maximum depth of water is 50 feet, and the maximum depth of wall over 90 feet. The water surface area is 41½ acres; and the top-water level 2454 feet O.D. The capacity is 200 million gallons. The profile and dimensions are given in fig. 5. A valve-tower adjoins each dam, with arrangements for drawing water at different levels, and for scouring purposes.

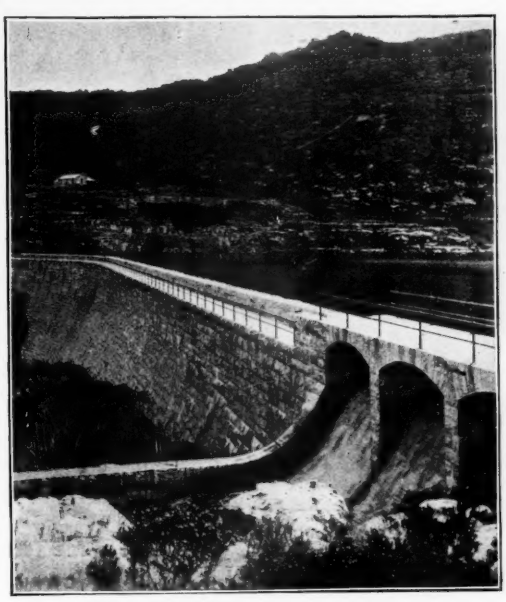

Fig. 4.—The Woodhead Reservoir, Table Mountain.

As it is essential to accurately regulate the supply from these reservoirs for town use, and to avoid any waste, a gauging basin has been constructed at the toe of the Hely-Hutchinson dam in which three V notch weirs are installed, and the water overfalls into the Woodhead reservoir. In the gorge below the Woodhead dam the author fixed a Venturi meter with self-recording arrangement, together with an electric transmitter to another recording mechanism in the caretaker's quarters, so as to enable this official to see what quantity is being sent down at all hours.

The water, after it discharges from this outlet, gravitates in the stream channel for a distance of about 4300 feet, collecting meantime the water which drains off the lower catchment area. At the bottom of the gorge, the water is conveyed to the intake, round which a wrought-iron grating is fixed to intercept extraneous matters; but fine comminuted mud and grit nevertheless find their way into the pipe-line already described.

The Table Mountain catchment area comprises 990 acres of rough, rocky mountain surface ranging from about 2000 feet to 3658 feet above sea level, a small proportion of which consists of a marshy valley called Waai Vlei; another part near the gorge is covered with vegetable mould; and the remainder includes mountain peaks, ravines, &c., free of trees and brushwood, but with some small shrubs and rough grass. The author recommended tree-planting for the purpose of retaining the moisture and giving it off more uniformly

and also to minimize evaporation, as well as to condense the wet mist which occurs during south-easterly gales.

Mocke Reservoir.

The Mocke reservoir, already mentioned, is situated at Kloof Nek, at an elevation of 876 feet above sea level, and has a capacity of 200,000 gallons. It was constructed in 1898 at a cost of £2868, the Engineer being Mr. Thomas Stewart. Its length is 80 feet, width 35 feet, depth of water 12 ft. 4 in. The walls, floor, and roof are entirely of Portland cement concrete; and the roof consists of semi-circular arches 14 ft. 9 in. spans, 9 inches thick at the crown and 18 inches at the haunches, covered with earth.

Sea Point Reservoir.

The Sea Point reservoir, which was also completed in 1898, has a capacity of 100,000 gallons, length 47 ft. 3 in., width 36 feet, top water 626 feet above sea level, depth of water 10 ft. 3 in., cost £1490. This is covered in the same manner as the Mocke reservoir.

The Mocke reservoir was originally considered as an enlarged break-pressure tank, and a means of supplying the high-level districts, which then had but few houses; but as the number grew very rapidly it became inadequate, and it was decided to construct another reservoir adjoining it, having a capacity of 3,000,000 gallons.

Kloof Nek Reservoir.

Inasmuch as it was necessary to provide a more efficient supply of water on both sides of a steep hill known as Kloof Nek, the only available site for the reservoir commanding the two areas was a patch of land 889 feet above sea-level on the slopes of Table Mountain, having a surface gradient of 1 in 5, and situated but a few feet away from the Mocke reservoir, which was the only means of controlling and affording a supply to the districts. Special precautions had therefore to be adopted to avoid any disturbance of this during the construction of the new reservoir.

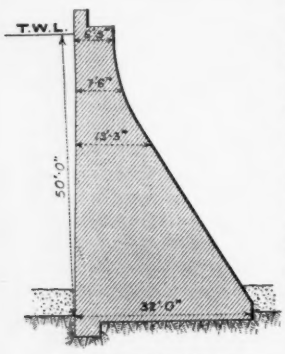

Fig. 5.—Section the Hely-Hutchinson Dam.

The geological formation consists of intrusive coarse granite containing 11 per cent. mica, 5 per cent. quartz, and 84 per cent. felspar. The felspar is more or less decayed, and the granite thereby disintegrated. There is also a dyke of dolomite in a similar condition crossing a corner of the excavation.

Care was taken in locating the works on this confined area so as to avoid the liability of erosion due to floods. The elevation of the works and the distance from the city rendered the cost of transport of materials somewhat high. The reservoir is circular in plan, having an internal diameter of 162 feet, and a depth of water of 24 feet. The maximum depth of excavation was 44 feet and the minimum 14 feet; but no shoring was required, as the disintegrated granite, although comparatively easy to excavate, exposed a fairly vertical self-supporting face during the whole period. A considerable quantity of the excavation was removed by wedging and barring, and when this was not economically possible, blasting was resorted to. Only a small quantity of the rock was useable for the concrete, but a large proportion of the excavated material other than rock was temporarily tipped on the hillside and afterwards used to form the embankment and roof covering.

Where the external concrete wall is entirely below the natural ground surface, its thickness is 4 ft. 6 in.; but where it extends above the same, the thickness is increased to 6 feet—in both cases tapering at the top towards the arches which form the roof.

When it was found that not only the exposed surface of the excavation but also the excavated material itself preserved a fairly permanent vertical face until it was weathered down, it was deemed advisable not to rely on any support from the embankment but to stiffen the exterior wall with seven buttresses along that portion which stood high above the natural ground level. In addition to this, steel reinforcement in the form of vertical and horizontal $\frac{1}{2}$-inch rods, spaced 1 foot apart, extended from the base to the top of the wall. The whole of the work was carried out in cement concrete mixed in the proportion of 4 : 2 : 1, all of which was machine mixed.

The floor is 15 inches thick, with a fall of 6 inches from the centre towards the perimeter. A dwarf division wall, 6 feet high, 3 feet thick at the base, and 2 feet thick at the top, was constructed along the centre line to enable one half to be cleaned while the other half was in use.

The roof consists of a central dome and five concentric rings of segmental arches resting on rings of semi-circular arches supported on piers or columns. The segmental arches have spans of 15 feet centres and a rise of 2 feet. The thickness was designed to be 4 inches at the crowns, increasing to 8 inches at the haunches; but these thicknesses were slightly increased. The spans of the supporting (semi-circular) arches vary according to the distance of the various rings from the centre. The segmental arches are reinforced with expanded steel sheets having a 3-inch mesh and $\frac{1}{4}$-inch by $\frac{3}{16}$-inch strands, each sheet overlapping the next 6 inches in all directions. Similar reinforcement is used in the haunches near the extrados, to take up any reversed stresses. Each column is reinforced with four $\frac{5}{8}$-inch round vertical bars, tied together by $\frac{1}{8}$-inch wire wound twice round each bar.

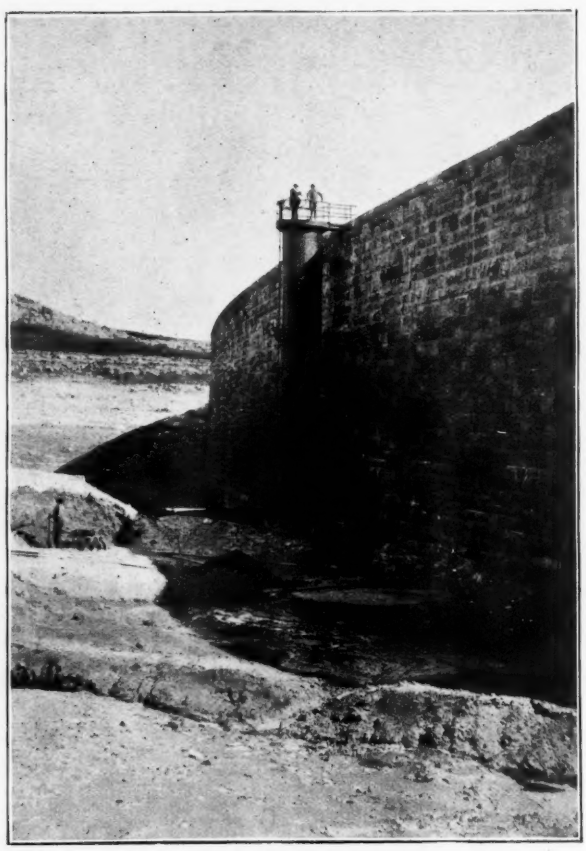

Fig. 6.—The Hely-Hutchinson Dam Completed, with Valve Tower.

These vertical bars extend from the base of the columns to the roof arches, and are bent at right angles at each end.

The interior of the reservoir walls, and the columns to a height of 1 foot above top water-level, as well as the extrados of the roof arches down to 4 feet below water level on the outside surface of the wall, are rendered with cement and sand mixed in equal proportions, and $\frac{3}{4}$-inch thick. Cast-iron ventilators and manhole covers are fixed on the crowns of the roof arches. There are also wrought-iron ladders affording access to the reservoir and valve chamber. The inlet supply pipes are 12 inches in diameter, connected to equilibrium valves; the overflow and outlets are 18 inches in diameter; and the scour pipe 12 inches in diameter. All these pipes are fitted with "puddle" collars bolted on and caulked to prevent leakage. Stoneware drains, laid dry, are provided in the haunches of the roof to carry off surface drainage. The embankment behind the external wall was carried up concurrently with the concrete work in layers of about 12 inches in thickness, watered, rolled, and thoroughly consolidated; the natural surface of the ground being stepped to prevent any tendency to slip. The roof is covered with soil 17 inches thick, sown with grass seed.

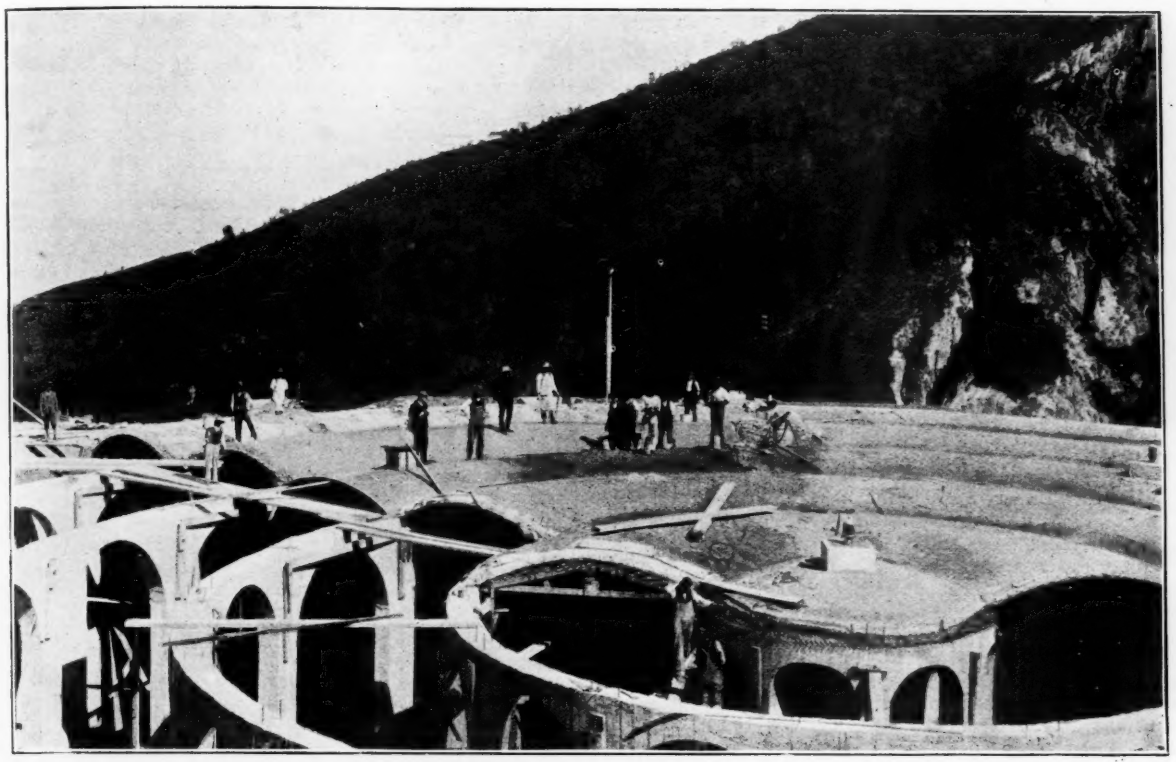

Fig. 7.—The Kloof Nek Reservoir under Construction.

Portland cement used on these works had to conform to the Engineering Standards Committee's specification, and was tested both in London and on the works so as to reveal any possible deterioration during transit. It was thoroughly aërated in a shed containing a series of louvre boarded floors, which were operated from the outside. The principal tests applied on the works were for fineness, tensile strength, expansion (Chattelier gauges), and by boiling of pats. It was found that if the cement complied with the requirements under the two latter tests, it was generally satisfactory in other respects.

The aggregate was crushed stone, which had to be carted up-hill from a neighbouring quarry. This was all gauged to pass a 1½-inch ring, excepting that used in the roof, which was gauged through a 1-inch ring. Sand was specified to

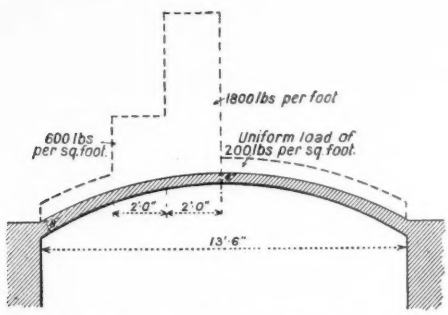

Fig. 8.—Reinforced Concrete Arch Tested to Destruction.

pass through a standard screen of 400 meshes per square inch, and washed if necessary. Owing to the frequent occurrence of high temperatures and the dryness of the air, care had to be taken at such times to keep the concrete moist by means of damp sacking, &c. The jointing between the old and the new concrete was carefully formed with **V**-joints 4 inches deep; the older work being picked cleaned and covered with a thick layer of cement mortar before the fresh concrete was applied.

For the purpose of testing the strength of the roof arches, which were designed to carry a dead-load of 150 lbs. per square foot and a live-load of 50 lbs. per square foot, two full-sized arches were constructed, each one foot wide; one being of plain concrete and the other reinforced near the intrados with expanded steel ¼-inch by ⅛-inch with a mesh. This reinforcement was of a lighter section than that used on the actual roof; and the results were thus proportionately less than would be obtained in the roof itself. The concrete was of the same proportions—the aggregate being hand broken to pass a ¾-inch screen; and the concrete was mixed by hand. Pigs of lead were placed on the extrados of the plain concrete arch until it was uniformly loaded to the extent of the load of the roof it was designed to carry, and without causing any deflection. It was then loaded on a space of 4 feet on one side of the crown until there was an additional load of about 800 lbs. per square foot on that area (the deflection being one-tenth of an inch), and the arch collapsed by shearing close to the abutment. This arch was left 51 days to set before the test was applied.

The reinforced arch was allowed to stand 37 days before the test was applied, and was then uniformly loaded to the same extent as in the previous case, after which the pigs of lead were piled upon one side of the centre as shown in fig. 8. Deflection took place more regularly in this case, until about a quarter-of-an-inch was observed, when the arch collapsed by buckling on the light loaded side.

Distribution of Supply.

The available power due to the fall from the Table Mountain is partially utilized by two 200-H.P. Pelton wheels making about 250 revolutions per minute; and these are coupled to alternators for the generation of electricity. These Pelton wheels work under a hydraulic head of about 580 feet; the tailwater being discharged into the Molteno reservoir for public use. Owing, however, to the irregular flow, which necessarily varies according to the consumption in the lower parts of the city, the plant is not regularly at work except during wet seasons, when there is an abundant surplus which can be allowed to run to waste.

Proposals to further develop this hydraulic power by erecting additional power stations along the mountain pipe line have been under consideration; but owing to the fact that steam plant equal to about 2000 K.W., or about 2600-H.P., has been installed at the Central electric light station, and to the fluctuating nature of the water supply, which is very marked for some months in each year, no steps have been taken in this direction. The development of hydro-electric power in this case is necessarily of secondary importance and subordinate to the maintenance of the water supply in this subtorrid city, where health must always be the first consideration of the authorities.

Owing to the configuration of the Table Valley and of the water district, it was necessary to arrange for three zones of supply so as to avoid excessive pressure in the mains as

far as possible. The lower part of the district is supplied from Nos. 1 and 2 reservoirs; the next zone is supplied from the Molteno reservoir; and the higher districts from Kloof Nek reservoirs. But, nevertheless, it is impossible without duplicating certain mains at considerable cost to avoid excessive pressure in one small district.

Inasmuch as the business section of the city lies in the hollow of the valley, where high and valuable buildings have been erected, the normal water pressure was insufficient for fire extinguishing purposes; and a special steel fire main has been recently provided from the Molteno reservoir to command the parts where the fire risks are great. This main ranges from 12 to 21 inches in diameter, and the total length is about 7 miles. At all important cross roads, &c., double sluice-valve hydrants are installed. The total cost was £22,616.

This is the only city in the southern hemisphere, so far as the author is aware, where such an installation has been provided; and the pressure and supply are now superior to that obtaining in most cities. These mains also serve the purpose of equalizing the pressure on each side of the Table Valley in the second zone, and meeting any extraordinary consumption, without causing the pressure to fluctuate.

As the coating of these steel mains was an important matter, the author made numerous enquiries as to the general practice in this respect; and in the year 1903, when on a visit to the United States of America, he made a careful investigation into the practice prevailing there. The coating in general use there is called the "Pioneer Mineral Rubber Asphalt," or, by some, "Assyrian Asphalt," and is a product of some hydrocarbon mines in Utah. The pipes are first thoroughly cleaned, heated to 300° Fahr., and then dipped, and when coated are re-dipped, the coating being much thicker than that applied in this country. The field joints and abrasions are twice painted with P. & B. paint. The author found this coating smooth, glossy, tough, plastic and adhesive; and in one case where some pipes had been rolled over stones near the Boonton dam, the coating had been scratched, but the steel was not exposed.

The author also visited a number of works in Great Britain; but so far as he could observe, the coating operations are carried out neither scientifically nor uniformly. This work is generally left to the workmen, who apply the "rule of thumb" when judging the consistency of the coating material; but nevertheless the solution is always called "Angus Smith's," although it varies in every case according to the "personal equation." In some cases it is excellent; in others it will flake off the pipes and perish when exposed to the atmosphere for a few weeks.

A consignment of steel pipes was coated with mineral rubber, and when efficiently done, this proved to be satisfactory. It was clear, however, that some experience is required to obtain the best results; and when thoroughly understood by the pipe-makers the author anticipates a more general adoption of this coating.

Another consignment of steel pipes was dipped in "Angus Smiths" solution, and before they cooled were spirally covered with jute or coarse canvas and then re-dipped. This also proved an excellent coating.

The total length of fresh-water mains in the district, ranging from 4 to 21 inches in diameter, is about 120 miles. There are also about 15 miles of salt-water mains in the city, 6 inches, 9 inches, and 12 inches in diameter. The salt-water pumping station is situated on the beach of Table Bay; and the plant consists of a 50-H.P. horizontal compound condensing rotary steam-engine directly connected to a pump, and a Gwynne three-stage centrifugal pump driven by an electric motor direct coupled.

Salt water is pumped direct into the mains in the city, and the surplus flows into a covered concrete tank situated on the "Lion's Rump," at an elevation of 279 feet, and having a capacity of 79,000 gallons. This water is used for street watering, sewer flushing, and other purposes when the supply of fresh is precarious.

The distribution of both fresh and salt water is registered and automatically recorded by means of ten Venturi meters of various sizes and types, in addition to which the local consumption in the various districts is recorded by Deacon and other meters.

The services or house connections consist of lead pipes of the weights usual in this country; and these are attached to a patent screw-down ferrule on the main, and are provided with a plug stop-cock under the pavements. The mains are always tapped under pressure. On the house side of the stop-cock, and immediately adjoining it, is fixed another cock with a solid spindle. When application is made (always by the owner) for a supply, he also states what quantity he requires per day—100 gallons per day for each house being the minimum, and all increases on this are simple multiples of 50 gallons per day. A groove is cut on the solid spindle of a size calculated to pass the required quantity.

This system of measuring is a survival of ancient days, when the supply was most precarious, and when some check on the quantity used was essential. The author believes that the method was in vogue in Paris until a few years ago, but that it has now been abandoned. In no progressive city other than Cape Town, as far as the author is aware, is such a system now retained. It is, however, in use in London to regulate the flow to flushing cisterns, and in that connection has probably been found satisfactory.

Under an Act of Parliament, the Cape Town Corporation are under obligation to supply water under similar conditions and at the same rate as that charged in the City to the adjoining Municipality of Green and Sea Point.

There were on June 30, 1907, 743 meters installed, apart from those in use for general water-works purposes, the majority of which are of the positive type. Latterly, however, the Council have resorted to the inferential pattern, probably owing to the lower initial expenditure incurred; but as there is a considerable quantity of finely-suspended vegetable matter brought down from Table Mountain, these do not work as satisfactorily as the positive ones.

Consumption of Water.

The following table gives the daily consumption for the years stated:—

Year.	Estimated Population Supplied.	Daily Consumption Average for the Year.	Quantity per Head per Day.
1900-1	79,000	2,121,000	26·8 gallons.
1901-2	80,000	2,262,000	28·3 ,,
1902-3	85,000	2,480,000	29·1 ,,
1903-4	90,000	2,514,000	27·9 ,,
1904-5	100,000	2,647,000	26·5 ,,
1905-6	95,000	2,661,000	28·0 ,,
1906-7	90,000	2,515,000	28·4 ,,

The daily consumption per head in other South African towns is as follows:—

Durban	64·0 gallons.
Port Elizabeth	13·4 ,,
Maritzburg	55·0 ,,
Cape Town Suburbs	22·7 ,,

The consumption of water by meters for all purposes, during the author's tenure of office as City and Water Engineer—viz., 1899 to 1906—increased considerably, as will be seen by the following figures:—

	Gallons per Annum.
1897	61,600,000
1898	86,834,000
1899	82,601,000
1900	137,680,000
1901	180,890,000
1902	202,690,000
1903	282,237,000
1904	292,193,000
1905	336,734,000
1906	316,869,000
1907	277,674,000

The last figure is made up as follows:—

Trade	141,352,000	gallons.
Domestic	105,188,000	,,
Building	1,768,000	,,
Miscellaneous	29,366,000	,,
	277,674,000	,,

Financial.

The revenue derived from the water-works undertaking during the period 1901-1907 was as follows:—

1901	£64,704
1902	79,490
1903	69,196
1904	68,543
1905	70,115
1906	71,490
1907	62,424

The annual payment of interest on loans sinking fund absorbed in 1907 the sum of £35,170.

The following sums were transferred to the general account in aid of the district rate funds:—

1901	£20,000
1902	37,783
1903	16,174
1904	9,842
1905	9,220
1906	12,555
1907	5,857
Total for seven years	£111,431

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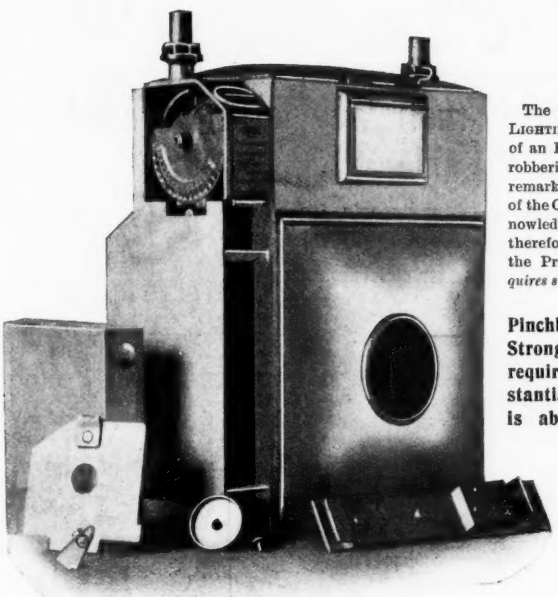

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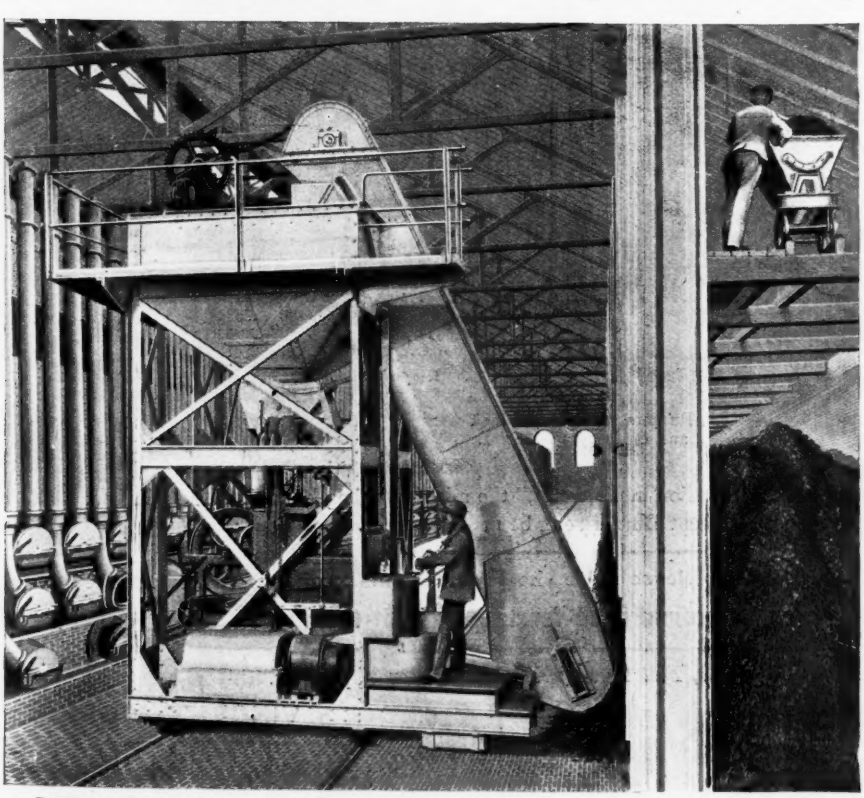

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These Burners cost less to maintain than any other Incandescent Gas Burner on the Market,

and are shown fitted with an ordinary Flashlight and with Carpenter's Patent Single-Tube Flashlight, which flash only burns with a long flame at the moment of turning on the cock.

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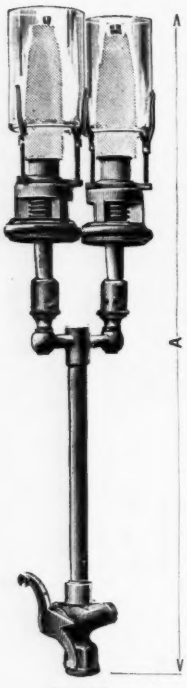

Fig. 26.
Burners with Lever Cock but without Flashlight, for use with Ball Trapdoor.

Fig. 27.
Burners with Lever Cock, Rings and Chains, and ordinary Flashlight.

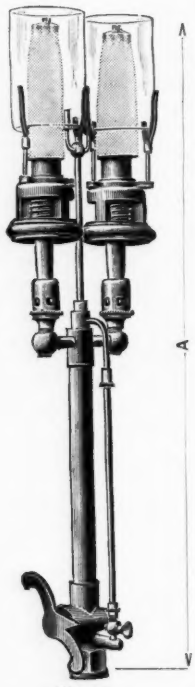

Fig. 28.
Burners with Lever Cock and ordinary Flashlight.

Fig. 29.
Burners with Lever Cock, Rings and Chains, and Carpenter's Patent Single-Tube Flashlight.

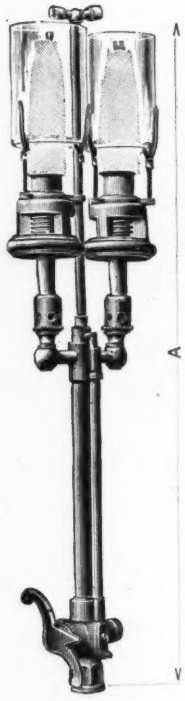

Fig. 30.
Burners with Lever Cock and Carpenter's Patent Single-Tube Flashlight.

When ordering please fill in the dimension marked "A," the minimum length of which is 15 inches.
A Cluster of any number of Incandescent Burners can be made to order.

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The capital expenditure at the end of 1907 stood at £836,170; the following being the principal items—viz.:

Plant and buildings	£34,511
Reservoirs	469,383
Mains and services	166,406
Fire mains	22,616
Tunnel and pipe track	45,003
Salt-water system	26,200

The present charges for water are as follows: Domestic supply, £2 5s. per annum (less 5s. discount if paid before June 30) for each 100 gallons per diem. Meter supply, 1s. 9d. per 1000 gallons (less 3d. discount if paid within the following month). Shipping supply, 2s. per ton.

New Schemes Proposed.

Before concluding this paper, it is desirable to bring the historical facts up to the present time, and the author believes it will be of some interest to refer to the investigations which he recently made into several large and comprehensive schemes with the view of the future augmentation of the water supplies in the city and six suburban municipalities.

While the Hely-Hutchinson dam was in course of construction, it was evident that the growth of the city and neighbourhood, and the increased consumption of water due to the introduction of an improved up-to-date sanitary system in the suburbs, would sooner or later create a demand in excess of the capacity of the existing water-works. A Commission was, therefore, appointed by the Government to inquire into the question; and, after an exhaustive examination of a number of witnesses, they reported *inter alia* as follows:—

1. That an increased supply of water should be obtained.
2. That the increased supply for Cape Town and suburbs should be equal to at least 10 million gallons per day, with the possibility of increasing it to 40 million gallons per day in the future.
3. That the supply should be drawn from a catchment area not more than 50 miles from Cape Town.
4. That a storage capacity of 2000 million gallons should be provided, together with the trunk mains.
5. That the authorities be empowered to raise a loan of £1,500,000 for such purposes.

While this Commission was sitting, the author had, by the authority of the City Council, commenced an investigation of the various catchment areas near Cape Town, of which the following summary may be given with regard to five out of the ten schemes reported upon:—

1. *Palmiet Scheme.*—Catchment area, 28⅔ square miles; estimated total available yield, about 28 million gallons per day; impounding reservoir capacity, 4830 million gallons; water surface, 526 acres; dam, 100 feet high above stream, 800 feet long; tunnel, 5·17 miles; trunk main, 39 miles.
2. *Zacharias Hoek Scheme.*—Catchment area, 43½ square miles; impounding reservoir, 6900 million gallons; water surface of reservoir, 588 acres; dam, 100 feet high, 1630 feet long; trunk mains, 41¼ miles; service and balancing reservoir at Klapmuts, 20 million gallons capacity.
3. *Wemmer's Hoek Scheme.*—Catchment area, 32¾ square miles; estimated total available daily flow-off, about 60 million gallons; impounding reservoir, 3400 million gallons; water surface of reservoir, 328 acres; dam, 100 feet high, 1251 feet long; trunk mains, 43¾ miles; service and balancing reservoir at Klapmuts, 20 million gallons; computed mean annual rainfall, about 82 inches.
4. *French Hoek Scheme.*—Catchment area, 29¾ square miles; mean annual rainfall, about 145 inches; estimated total available daily flow-off, about 100 million gallons; impounding reservoir, 8200 million gallons; dam, 100 feet high and 2030 feet long; water surface of reservoir, 676½ acres; trunk main, 44 miles; service and balancing reservoir, 20 million gallons.
5. *Steenbras Scheme.*—Catchment area, 23½ square miles; estimated total available daily flow-off, about 16 million gallons; impounding reservoir, 6000 million gallons; water surface of reservoir, 827 acres; dam, 90 feet high and 1113 feet long; trunk main, 38 miles. Nearly 1000-H.P. could be developed in this case by suitable turbines. Figures in this scheme were obtained from Mr. Thos. Stewart's report.
6. *Warmberg Scheme.*—Catchment area, 13 square miles; estimated total available daily flow-off, 45 million gallons; computed mean annual rainfall, 167 inches; impounding reservoir, 2472 million gallons; water surface of reservoir, 180½ acres; dam, 130 feet high and 970 feet long; trunk main, 47¾ miles; service and impounding reservoir, 20,000,000 gallons.

As no ordinance maps were available the whole of the catchment areas had to be carefully surveyed, involving heavy work at elevations ranging up to about 6000 feet above sea level. The reservoir basins were tacheometrically surveyed, many thousands of spot-levels were taken, and from these contours were plotted by which the capacities were easily computed for every five feet in height. [The author would in passing urge on the younger members the advantage of being proficient in the use of the tacheometer and other modern instruments.] Plans, details, and estimates were prepared of all the schemes; the cost of 10 million gallon schemes varying from £600,000 to £1,000,000—the total cost of the schemes investigated being about £7,000,000.

The schemes most in favour were the French Hoek, Warmberg, and Wemmer's Hoek. The City Council and the majority of the suburban municipalities promoted a Bill to carry out the Berg River scheme, but owing to the session being held much earlier than usual, the Parliamentary Committee decided to defer consideration until the following year. It was again brought forward, but subsequently withdrawn by the promoters on account of the opposition it evoked, and to the serious financial depression which set in at the time, and which unfortunately continues to-day, in all of the South African Colonies. It was ultimately decided to suspend all operations and postpone further consideration of the matter indefinitely.

The suburban municipalities, however, being in more urgent need of an augmentation of their water supply, last year promoted a Bill of their own for the construction of a modified Wemmer's Hoek scheme; but, though the scheme was sanctioned by Parliament, the work has not yet been undertaken.

Discussion.

Mr. Easton Devonshire (London) said a point that interested him in the paper was in connection with the reinforced construction of the reservoir. It seemed to be a very interesting reservoir to the engineer. But he did not quite follow the way in which the sheets of expanded metal were used in strengthening—probably as a tensile member in this case—the arches. It appeared they were standard sheets, 8 feet in length; and they overlapped 8 inches. But he did not see whether they were firmly attached to each other before being laid, so that the meshes interlocked, making a practically continuous sheet. If this was not done, nothing like full value was got out of the reinforcement. If they broke joint, if they had not a continuous sheet of metal as reinforcement, they did not get very much advantage. Tests that he had made on arches reinforced with expanded metal showed this. He had tried expanded metal, wire netting, and similar materials, and they all acted in a similar way. In an arch equally loaded throughout, the reinforcement was of minimum utility; the whole structure being under compression. If it was loaded (as shown in fig. 8) then the expanded metal came into play as a tensile member for the unloaded portions of the arch. They could imagine a concrete arch of a certain thickness as being divided into a large number of small segments, absolutely the same shape, put together as a stone arch—narrow, tapering segments, all fitted together. An arch of this sort would stand an immense load; but the least loading on the side would cause deformation, and would tend to force out the wedge-shaped stones where there was no load. The use of reinforcement in an arch of this sort was to tie together the short ends as it were, or the points of the wedges forming the arch. He was assuming a number of wedges forming an arch; and if a load was put on on one side, they could, by the pressure, shoot out a wedge on the other side. But if, by a network of expanded metal, they attached firmly together the short ends of the wedges, they would prevent such a happening. Consequently, the whole of the strength of reinforcement was, he thought, dependent upon the con-

tinuity of the sheets of expanded metal, or similar reinforcement, from side to side throughout. If the sheets were simply overlapped, the line of overlap was a weak point in the chain; and they might by overloading on one side of the arch cause a breakdown. Here there seemed to be no rigid attachment between the sheets; they were merely overlapping, and were simply dependent upon the concrete forming a key to hold them together. What he wanted to do by using reinforcement was to hold the concrete together, and not use the concrete for holding the reinforcement together. He thanked Mr. Wynne-Roberts for the amount of information he gave; and if he could impart further details with regard to cost, they would be very valuable. For instance, there was the question of the concrete. The concrete was a mixture of 4 to 1, and the cost depended upon the nature of the concrete. This detail was not given. He saw, too, that the columns were rendered in the reservoir described. Why render the column? In his own case, he had come to the conclusion that this expense might be saved. There was no necessity for rendering for the protection of the metal under the water, because, if the concrete was fine enough and well made, there was absolutely no fear of the steel being affected by moisture. In any concrete that was really homogeneous, they got in the water very rapid crystallization of the lime, and perfect protection of the metal.

Mr. William Watts (Wilmslow) said the contribution was a very valuable one. In fig. 1, he noticed a very deep shaft with a screen at the bottom; and he was curious to know how this screen could be taken out of its position and cleaned. If a screen was worth anything, of course it wanted to be sufficiently fine to arrest material in suspension; and he did not see how the screen could be got at in the position shown. In regard to the great length of 6-inch pipe for a distance of 20 miles or thereabouts, it seemed to him very small indeed. He should not venture to lay a pipe so small, for so long a length.

Mr. Wynne-Roberts said Mr. Watts had mistaken the length.

Mr. Watts: What length did you give?

Mr. Wynne-Roberts: All you are referring to is the mountain-line. The 6-inch part was a very small portion.

Mr. Watts: Well, then, say 4 miles. I should consider 6 inches too small for that length. Proceeding, he said with regard to the spans in this great depth of reservoir, they were only 15 feet apart; and it did seem to him that the pillars should have been built wider apart for so great a depth, and the spans lengthened. As to the rendering, he quite agreed with the last speaker that it was absolutely unnecessary, if they made the concrete sufficiently moist—jelly-like—to begin with. He had ceased rendering concrete in his works for a great number of years, as being an additional expense without providing any advantages. Then with regard to screening, if the aggregate were clean, there was no necessity whatever to screen the sand. Personally, he went in for a sand fairly rough—as rough and gritty as he could fairly get it. He believed that the best concrete was obtained by having a rough, gritty sand and clean stone; and washing the aggregate was absolutely unnecessary, if care be taken to use stone clean from the quarry. Above all things, keep the muck out, and get in as much grit as possible; and if this were done, a good concrete would be obtained. Sand should always be used in sufficient quantity in concrete required for water-tight work, and the aggregate, with the added proportion of cement, carefully mixed—not simply turned over as a child shovelled sand to form a tiny sand dune.

Mr. William Matthews (London) said it seemed to him this was one of those particular cases where reinforced concrete construction came in very handy. It was a site limited in area; but by adopting reinforced concrete they were able to get in a reservoir of 3 million gallons capacity, A depth of 24 feet of water was a great one for such work. Mr. Watts had pointed out that the supporting piers were very small; but he (Mr. Matthews) thought he had omitted to notice they were reinforced by vertical steel bars. He quite agreed with Mr. Devonshire as to the reinforcement of the arches; he did not think there was anything like the value to be got out of reinforcement unless it was continuous. Of course, in the case of long bars, there must be overlapping, and the work be done very carefully, so that the concrete should properly surround the bars, and be sufficient to prevent them being drawn apart. He had also noticed the quantity of water that was being used in the last year. It seemed to have been only 28½ gallons per head per day, which, in a climate like South Africa, appeared to be very reasonable indeed. This was one of those interesting cases where they had had cast-iron pipes in use for a long period. It would be valuable if Mr. Wynne-Roberts would tell them in what sort of soil the pipes were laid, and what was their condition at the present day. There were not many instances of such pipes that were laid in the early part of last century; so that their life and condition were points on which information ought to be collected. He should like to know in all cases whether the iron was cold or hot blast, because he believed the reason for the very long life of some of the older pipes was due to their being cast from cold-blast iron.

Mr. C. Clemesha Smith (Wakefield) observed that the last speaker referred to cast-iron pipes being laid a considerable time. He (Mr. Smith) had in his charge works in connection with which were some mains that were laid about 1838. They had a 10-inch main laid for pumping purposes in 1839 or 1840. At the present time, owing to alterations in the system, it had to bear double the pressure it had to do originally; and it gave no trouble at all. This was a good testimonial for the quality of pipes laid 70 years ago.

Mr. Matthews: I was referring to the amount of corrosion that had taken place.

Mr. Smith said that he found the internal incrustation amounted with peaty water to about 1 inch in the larger pipes; if smaller pipes were referred to, it was more.

Mr. R. Askwith (Bishop Auckland) said that he had also noticed the point raised by Mr. Watts regarding the screen on the outlet pipe of the reservoir, which in its position was necessarily difficult to clean, and which when drawn up for cleaning would be liable to allow the deposit to go down the pipes. The best method of screening the pipes of reservoirs was to have the screen in duplicate placed side by side on the delivery-pipe outside the reservoir; so that the deposit on the face of one screen could be forced off by passing the water back through the second screen. In this connection, he might state that he at one time had to remove from a screen as many as 2000 small fish each day; and a great deal of trouble had been prevented by this plan. On the question of reinforced concrete, Mr. Devonshire had pointed out very properly that expanded metal as employed here was a somewhat rule-of-thumb way of strengthening concrete in the arched covering of the reservoir. It seemed to him (Mr. Askwith) a better plan to carefully work out the strains, and to build arches with bars of iron. If they were not built up and the concrete put in in a proper manner, they would not have a properly constructed arch. The concrete should be put completely round each bar of iron; and great care taken that every bar was linked into the end of the next bar, and concrete put well round the links. As to the point raised about the strength of pipes after having been laid a great many years, it seemed that Mr. Matthews was referring to the outside of the pipe. The state of the inside of the pipe, of course, depended upon the water that was being passed through. Soft water caused a good deal of furring up; and hard water caused a good deal of filling up. He had pipes laid in 1848, which were extremely strong now, owing to the nature of the ground in which they were laid. As a matter of fact, they had become stronger and stronger. There was a deposit outside more than ¼ inch thick; and it was almost impossible to break the pipes now.

Mr. C. H. Roberts (South Staffordshire Water Company), referring to the section of the Woodhead dam, said he should like to see the stress lines on this section; and also to hear an explanation from the author as to why the dam was designed in the way it was. In the paper, the author said: "The centre portion for a length of 155 feet is built curved in plan, with the convex face up-stream, and a radius of 250 feet." He should be glad if Mr. Wynne-Roberts would say whether the curvature was taken into account in designing the section of the dam. He (the speaker) believed that it was not uncommon, especially among American engineers, to design dams curved in plan; but he knew of few cases where the designers had been bold enough to rely on the added strength due to the arch form, and reduced the sectional area accordingly. If any reliance had been put on the added strength in this case, it would be interesting to know how the stresses were transmitted from the curved part through the flat portion to the sides of the valley.

Mr. T. Molyneux (Stockport) said, with regard to the action of water on lead pipes, he agreed with the author that a coating did form on them, and that the plumbic action only took place when the pipes were new. If by any means they

could arrange for new pipes to be coated—not tinned—to take the newness off, they would hear less of plumbism.

Mr. C. H. PRIESTLEY (Cardiff) remarked that there was only one point to which he would now refer. Mr. Smith had stated that incrustation only occurred with certain pipes. In the Cardiff water-works system, they had 35 miles length of 29-inch pipe laid twenty years ago, in which incrustation had been going on from the commencement, and increasing year by year. They had now a difference in delivery of quite 25 per cent. less, compared with the delivery when the pipes were first laid.

Mr. WYNNE-ROBERTS, in reply, thanked the members for their kind reception. Re garding Mr. Devonshire's remarks as to the reinforcement of the roof, the expanded metal was not joined together. It was simply laid overlapping about 6 inches in every direction; and the concrete was well worked in. It was found that this would take all the stress required of the metal in that particular position. There was no possibility, so far as they could see, of any stress being put on the arches, by unduly loading them in this particular instance. Another feature was that this was the first reinforced concrete roof carried out in South Africa, so far as his knowledge went; and they had to take the metal, which was already prepared more or less, so that they reduced the danger of wrong placing in the arches. This was one reason why they adopted this form of reinforcement. Further than that, as would be noticed by the paper, a full-sized reinforced arch was tested exactly as it would be placed in the roof of the reservoir; and as would be observed, the results of the tests proved that the arch was much in excess of the strength for which it had been designed—in fact, it proved so satisfactory that it was thought undesirable to make any change whatever. With regard to the rendering of the columns, he quite agreed with Mr. Devonshire. He (Mr. Wynne-Roberts) hesitated very much whether they should render the walls at all; but the same argument came into force. It was the first they had carried out of the kind, and to be doubly sure that it was made of sufficiently close texture, and to provide against any porosity, they decided to have it rendered. Mr. Watts referred to the screen in the Molteno reservoir. The screen was placed in the centre stand-pipe; and he knew it was a most inefficient design. However, there it was; and they had to make the best of it. The screen was placed inside the special connection that took the water from the valve on the water side of the tower; and as it flowed through the flap-valves, it passed through the screens, and every time they required cleaning a man had to be dropped down to take them out. This was by no means a satisfactory method; but it was carried out ten or twelve years before he went there, and so he could not very well alter it. Mr. Watts also commented on the 6-inch pipes. It would be observed that the 6-inch pipes of the mountain pipe-line were of extremely short length. They were only placed where the inclination was 1 in 1·37. It was a very steep place; and in parts practically vertical. In fig. 2, a fine, white line would be noticed on the top right-hand corner where the pipe-line had to be laid. From this could be judged the difficulties that had to be encountered. Regarding the length of the columns, it was a permissible length. It was 1 in 19. The length was 19 times the least diameter. In reinforced concrete, 1 in 20 was permitted, and even 1 in 22; but this was 1 in 19. Respecting the sand, unfortunately they had not an abundant amount of suitable materials at hand as they generally had in this country; and they had to make the best of what was available. Part of the sand came from the beach, part from crushed granite, and part from the excavation of the felspar washed out. It was doubly necessary to have it of a certain grade, so as to be sure the contractor took care not to force all sorts of sand on to them, but only what they were paying for. As to the old pipes, he took up some laid down in 1819; and it was surprising to notice their condition. The nature of the soil was partly decomposed granite. There were no acids. The soil was dry, with little clay; and the corrosion of the pipe was very thick outside. It was more of a vegetable matter than actual corrosion; and they found it a far more difficult matter to break up the old 12-inch pipes than 12-inch pipes cast to-day. The ductility of the metal was such that it would not break without being hammered for a length of time; but they wanted to dispose of it, so that they had to persevere. With reference to Mr. Roberts's question, as he (Mr. Wynne-Roberts) had mentioned in his paper, he was not the Engineer for the Woodhead dam; and, therefore, he could not give him the stresses.

THE EFFECT ON PRACTICAL WORKING OF THE SEALS AND PRESSURES IN THE HYDRAULIC MAIN AND RETORT.

By Dr. HAROLD G. COLMAN.

[A Lecture delivered before the Irish Association of Gas Managers, Aug. 11.]

When your Hon. Secretary first asked me to speak at this meeting, he added the request that I would choose some subject which might prove of use and interest to those of you having the control of smaller works. With this request I will try and comply; and though the choice of a subject is always a matter of difficulty, largely because the number of possibilities is so great, I think that some matters connected with retort-house working will probably prove most suitable.

The whole question of carbonization has at present reached a most interesting stage, and the eyes of all of us are irresistibly attracted to the newer developments now being so actively worked upon both here and abroad, including the employment of the completely filled retort, charged either continuously or intermittently, as well as the carbonization of the coal in larger bulk than is the case in gas-retorts, such as occurs in the large carbonizing chambers or still larger coke-ovens. Whatever may be the ultimate success of any or all of these processes, I for one feel convinced that the eventual result will be a material alteration in the methods adopted in gas-works, which have undergone but little change in general principles for the past 100 years, greatly though they have modified and improved in detail.

But while fully admitting the probability of important changes in the near future, it seems to me that it would nevertheless be a great mistake to concentrate our attention solely on the newer developments, and to neglect the full consideration of the existing method of carbonization in horizontal or inclined retorts only partially filled with coal. The newer systems, however successful, can only come into use gradually; and for many years to come the horizontal retort will still be the means by which the bulk of the coal gas is made, especially in smaller works. Until the time comes for the relegation of these to the museum, as representing past history, every effort should be made to obtain the best possible results from them.

In the working of horizontal, or indeed of any form of retort or oven, it is self-evident that the first essential is the maintenance of good and even temperatures throughout the settings; for unless this condition is fulfilled, the prime object of the manufacture—namely, the driving off of the volatile matter from the coal—cannot be properly effected, and subsequent working, however good, can never compensate for failure in this respect. But while it is true that good and regular heats are the *sine quâ non* of gas manufacture, it is equally true that much of the advantage gained by good working in this point may be largely lost through unsuitable disposition and working of the subsequent retort-house plant; and it is with regard to the latter that I propose especially to occupy your time to-day, for these are matters which are of equal importance to gas managers, whether they have only two or three beds of retorts, or whether they have a hundred.

After I had sketched out the plan of my remarks, the same subject was treated of in a very valuable paper read at the last meeting of the Eastern Association of Gas Managers by Mr. Paternoster, of Felixstowe, under the title "Retort-House Working for Small Retorts," which was followed by an interesting discussion. In view of this, I was at first inclined to change my subject; but on further consideration it seemed to me that, in view of the importance of the subject, this was perhaps unnecessary, and that as my remarks must necessarily deal with the matter more from the theoretical standpoint, the two papers would, in spite of some overlapping, be complementary the one to the other.

Shortly put, the view I wish to place before you is that next to retort temperatures, the most important point in making gas in horizontal or inclined retorts is the maintenance in the retort itself of as nearly uniform a pressure as possible, not exceeding that of the atmosphere by more than 1-10th or 2-10ths of an inch, and it is the reasons for this, and the necessary procedure to obtain it which I propose now to discuss, more especially with reference to those works where the hydraulic seal is used—this being probably the case at the majority of works with which those present are connected.

In the hydraulic main the dip-pipes are sealed in the liquid contained in the main to a depth varying at different works; and this of necessity throws an additional pressure on the retort corresponding to the amount of seal used. To counteract this, the exhauster is worked in such a manner as to maintain a vacuum in the hydraulic main nearly as great as that corresponding to the depth of the seal, in order as far as possible to maintain the actual pressure in the retort only slightly above that of the atmosphere.

Taking first the most familiar and obvious points, it is well known that if a steady and uniform pressure is to be maintained in all the retorts, the dip-pipes must all be sealed to exactly the same extent, the vacuum in the main above the surface of the liquid must be kept constant, and the sealing liquid should be

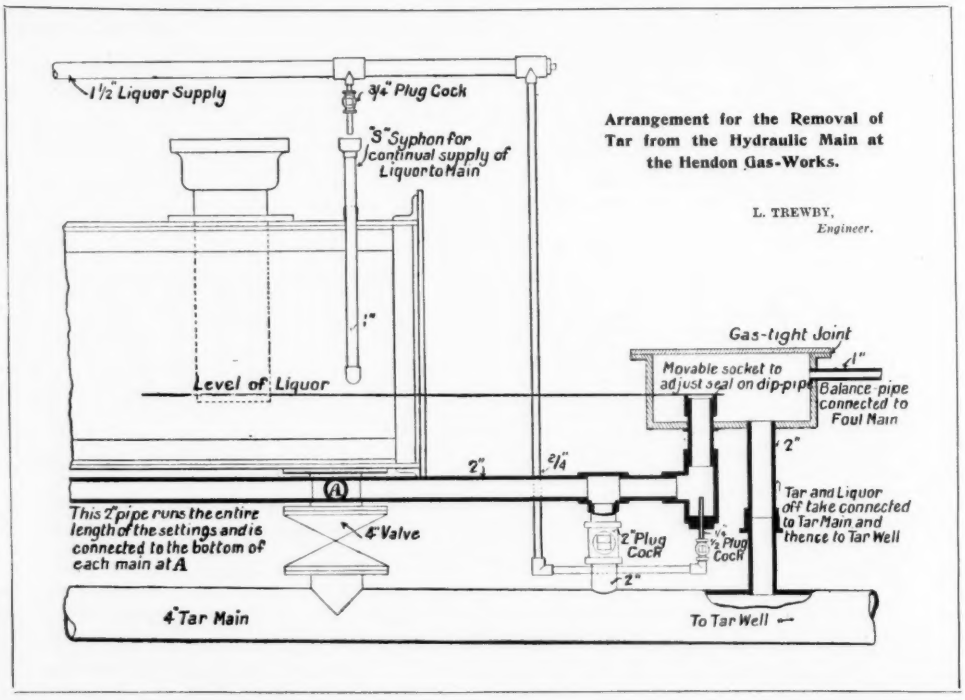
mobile and uniform. The importance of equality of seal is well recognized, but still in many cases the arrangements are such that only a very rough approximation to this ideal is obtained. Thus when the hydraulic main itself is supported on the brickwork of the setting, the irregular expansion of the latter brings about considerable alteration in the level of the main, with the result that some of the dip pipes are lightly sealed and others heavily sealed. Just the same result follows if insufficient care has been taken in erecting the ironwork to see that all the dip-pipes are of exactly the same length and fixed in a truly vertical position, with the ends properly turned up.

What is then the result when such a state of things occurs? Take, for example, a case in which the supposed seal is 1 inch, and a vacuum of 9-10ths is maintained in the hydraulic main, but in reality some dip-pipes only have the proper 1-inch seal while others are sealed to a depth of 1½ inches and others to only half-an-inch. If the 9-10ths vacuum is maintained, there will be an average pressure of 6-10ths in the heavily-sealed retorts, which results in loss of gas through the porous fire-clay retort; while in the lightly sealed retorts there is a vacuum, resulting in the drawing-in of furnace gases from the setting, which, while it certainly increases the make, deteriorates its quality to a still greater extent. Further, when the retorts are being charged and the lids are open, air is drawn into the gas through the ascension pipe in the lightly-sealed retorts; thus still further reducing its quality. Nor does the trouble stop here, for the drawing in of the hot furnace gas into some of the retorts raises the temperature of the issuing gas, bringing about increased trouble in the way of stopped ascension pipes and pitched hydraulic mains. The result of this state of things is, therefore, increased trouble in retort-house working, loss of good gas on the one hand and on the other deterioration of the quality of the gas made owing to the drawing-in of furnace gases and air; and in order to keep up the quality, it is then necessary to lower the vacuum in the hydraulic main. This may achieve the desired result, but it is done at serious expense in loss of make, for the heavily sealed retorts now have a still higher pressure, so that more gas is forced into the setting and lost up the retort-house chimney. This loss would have been quite unnecessary had the hydraulic main and dip-pipes been in proper condition.

The importance of maintaining a steady vacuum in the hydraulic main is universally recognized, and a very large measure of success in this respect has been attained by the proper governing of the exhauster by means of the vacuum in the hydraulic main itself, but still greater uniformity has been obtained in late years by the use of the retort-house governor—first made practicable and adopted by Mr. Charles Carpenter, and which is now in use in many works. Recent technical literature contains many communications as to the improved working obtained where this has been adopted; the latest being Mr. Paternoster's paper already referred to, which is especially interesting as representing the results of its installation in a small works. Not only is a more regular vacuum maintained by an automatic control, but, in addition, the inevitable pulsations of pressure due to the revolving exhauster blades are also materially diminished—a matter which will be again referred to later.

A further essential for the best working is that the liquid forming the seal should be uniform and mobile, and not one varying in consistency like the mixture of tar and liquor condensing in the hydraulic main. Therefore, to attain this end, the tar must be removed as quickly as possible from the latter, leaving only the liquor to form the seal. One of the forms of apparatus used to attain this end is the Dillamore tar tower, with which most of you will be familiar; but I have recently seen another method in use, which appears to be very suitable for works of moderate size. This arrangement has been devised by Mr. L. Trewby, the Engineer of the North Middlesex Gas Company, and his assistant Mr. Allan; and by Mr. Trewby's permission, I am enabled to describe their method here to-day.

The nature of the plan adopted is readily seen from the


1½" Liquor Supply
¾" Plug Cock
3" Syphon for continual supply of Liquor to Main
1"
Level of Liquor
Gas-tight Joint
1"
Movable socket to adjust seal on dip-pipe
Balance pipe connected to Foul Main
2"
2"
2¼"
A
This 2" pipe runs the entire length of the settings and is connected to the bottom of each main at A
4" Valve
2" Plug Cock
½" Plug Cock
2"
Tar and Liquor off take connected to Tar Main and thence to Tar Well
4" Tar Main
To Tar Well

Arrangement for the Removal of Tar from the Hydraulic Main at the Hendon Gas-Works.

L. TREWBY, *Engineer.*

accompanying diagram. Each section of the hydraulic main is provided with the usual syphon for running-in liquor to the main, and a run-off pipe for emptying the main. Into each of the latter, just above the valve, a short piece of pipe is fitted, all of these being connected to a 2-inch pipe running the entire length of the settings. This latter is closed at one end, and at the other is turned vertically upwards into a special collecting chamber, until the top is approximately level with the end of the dip-pipes in the hydraulic main, a moveable socket being placed on the end to adjust the depth of the seal. This chamber is used with a gas-tight cover, and is connected at the bottom to the tar and liquor main, while from the side a 1-inch pipe is connected to the foul main, to assure the pressure being equal to that in the hydraulic main.

Without some special arrangement to induce its flow, the heavy tar lying in the 2-inch pipe will not pass forward into the chamber unless the level of the liquor in the hydraulic main is an inch or two higher than the top of the pipe in the chamber. To give this necessary assistance, a small supply of liquor from an overhead tank is introduced through a ¼-inch pipe into the 2-inch pipe just where it turns vertically upwards; and this liquor stream, entering with considerable velocity, acts as an injector, and draws the tar away from the hydraulic main as it settles to the bottom, and causes it to flow continuously with the liquor to the tar well, without any necessity for running it off periodically by hand as is the case with the Dillamore tower.

Mr. Trewby finds that so long as a constant and sufficient head of liquor is maintained in the tank supplying the "injector," no appreciable quantity of tar can be found at any time in the mains, and that since the introduction of this plan, not only has there been no trouble with tar in the mains, but he has also been enabled to maintain a very steady vacuum in the hydraulic main and retorts. The best plan to ensure a steady head of liquor is to pump the latter into a tank placed well above the hydraulic main level and to keep this always full to the overflow; the same tank serving, of course, for the supply of liquor direct to the hydraulic mains through the syphon provided for the purpose.

The importance of these three points—uniform depth of seal, regularity of vacuum, and uniformity of the liquid forming the seal—for good carbonization is universally admitted. The question I want now to consider is whether the maintenance of these conditions alone, essential as they are, is in itself sufficient for the attainment of what after all is their ultimate object—namely, to ensure a constant and even pressure in the retort itself; and to this question I think the answer is in the negative. That this is so, anyone can see by putting a pressure-gauge on the retort mouthpiece itself, when it will be observed that, even though the hydraulic main vacuum is quite steady, the pressure

in the retort is not constant, but is rapidly pulsating or oscillating, changing from pressure to vacuum and from vacuum to pressure every few seconds.

The cause of this oscillation of pressure lies in the bubbling of the gas through the seal; for as the gas comes out of the end of the dip-pipe under the liquor it first forms a bubble at the end, which depresses the liquid in the main, thus temporarily increasing the pressure in the retort. As the bubble breaks, this extra pressure suddenly ceases, and a vacuum may follow in the retort, and this change keeps on every few seconds as long as the gas is coming off. If the extent of this pressure oscillation is considerable, as it certainly very often is, results detrimental to good carbonization at once follow; for during the pressure period coal-gas tends to escape through any cracks in the retort into the setting, while during the vacuum period furnace gases are drawn into the retort in a similar manner. Even if the retort is fairly sound so far as cracks are concerned, this alternation of pressure and vacuum has a deleterious effect, for the fire-clay material of the retort is porous, and during the pressure period some of the gas is forced into the pores of the retort; and though before it has got through into the setting it is drawn back again by the succeeding vacuum, it has in the meantime been in contact with an immense surface of highly heated solid matter. This is the best condition that can be brought about to promote the formation of carbon on the retort and to break up the tar vapours into denser products, which increase the worries of stopped pipes and pitched hydraulics.

Now the extent of the pressure oscillation caused by the bubbling of the gas through the liquid seal depends on many different circumstances; increase in the diameter of the dip-pipe increases the extent of the oscillation, and so in a very marked manner does increase of the depth of the seal. It is not, therefore, as is sometimes supposed, a matter of indifference how great the depth of seal, so long as a correspondingly increased vacuum is maintained in the hydraulic main; for although the average pressure in the retort will be the same in both cases, the extent of the deleterious oscillation of the pressure will be much greater with the heavier seal, and it is a familiar fact in every-day work that when a retort is found to be more heavily sealed than the others carbon is deposited in it more rapidly, and the ascension pipe stoppages are much more frequent.

This matter of the oscillation of pressures in the retort itself, though well known to many, seems to have been but little considered in technical literature, but it was discussed in a very able paper* read some 31 years ago before the North British Association by that master in the principles of carbonization, the late Mr. William Young, of Peebles; and I cannot do better than refer you to this paper.

There is, also, a further point affecting this oscillation to be considered—namely, the character during actual working of the surface of the liquid in the hydraulic main. This is far from being the true horizontal surface we depict in our sketches, but is much more like that of a storm-tossed ocean, the surface being covered with rapidly moving waves, so that the dips are sometimes sealed in the crest and sometimes in the trough of the waves, thus further increasing the amplitude of the oscillation of pressure in the retorts. Moreover, the heavier the seal the more violent is the commotion caused by the bubbling, resulting in higher waves on the surface of the liquid, so that in this respect, also, increased depth of seal is disadvantageous.

All these things tend to happen, even when the obvious conditions mentioned above are fulfilled. If this is not the case and the dips are unequally sealed, or some sealed in tar and others in liquor, or if the hydraulic main vacuum is unsteady, the extent of the oscillation is enormously increased; and I have known this under unfavourable conditions to be measured in inches and not in tenths, with disastrous results both in loss of gas from the retorts and in the drawing-in of furnace gases and air into the gas. On the other hand, where good carbonizing results are being obtained, I have often found the oscillation of pressure in the retort itself not to exceed one-tenth or two-tenths of an inch.

The particular moral to be drawn from these considerations is that it is necessary, for good carbonization, to keep the seal as light as possible consistent with safety and the avoidance of sucking-in air through the dip-pipe during charging. Light seals of about half-an-inch can, however, only be worked when the dips have been carefully levelled, and the hydraulic main vacuum is very even; and it is partly by reason of this that I think the retort-house governor has proved so successful, as not only does it maintain a better average vacuum, but it also largely eliminates the pulsations due to the working of the exhauster, and prevents these reaching the hydraulic main, thus rendering lower seals possible.

It is also advantageous to try and reduce the oscillation by making the evolution of the gas from the seals take place in as small bubbles as possible. One method of doing this is to turn the end of the dip-pipes to a knife-edge instead of leaving them square; the sharp end causing the bubbles to break much more quickly. Mr. Leslie Cloudsley and I have suggested another method of doing this, applicable to existing dips without removing them. It is a modification of the old serrated dip, and consists in placing inside the dip-pipe a sheet-iron sleeve, having at its end square serrations, which is fixed so that these serrations only come just below the bottom of the dip, thus causing the gas to pass out through these in a series of small bubbles. The sleeves being only fixed lightly inside the dip can at any time be readily removed for cleaning if necessary.*

I have mentioned the disadvantage brought about by the agitation of the liquid in the hydraulic main, inasmuch as this increases the oscillation of the pressure in the retort; but it is only fair to point out that this is not in every way a disadvantage. Mr. James W. Helps, of Croydon, has pointed out to me that, although the agitation of the surface is objectionable, the fact that the whole body of liquid is in motion is of great assistance in helping away the thick tar from the hydraulic main and preventing its accumulation there; and he has found in some cases that where by careful attention the agitation of the liquor has been greatly reduced, trouble from accumulation of tar has followed. From a study of different hydraulic mains, Mr. Helps finds that shape makes a great deal of difference in this respect, and that with some sections it is possible to get a good washing action from the motion of the body of the liquid as a whole even while the surface is kept fairly uniform and free from waves, and that in others the reverse is the case. This is an extremely interesting point, and shows how in carbonization matters which at first sight appear quite unimportant may materially affect the working.

From what has been said, it will be seen that the hydraulic main, useful as it is in forming a convenient and automatic non-return valve, enabling the retort to be opened safely at any time, nevertheless brings many disadvantages in its train; and all the precautions mentioned to-day, with the exception of the maintenance of a steady vacuum, are necessitated by the use of the liquid seal. The question naturally arises whether it would not be better to do away with the seal altogether, and use a dry main with suitable non-automatic valves for shutting-off the retort during the charging interval. As you know this forms a very old controversy. I do not propose to enter into it now, as for one thing time will not permit, and for another I cannot speak here from personal experience, for I regret to say I have no practical knowledge of the working of dry mains. But at the same time, I feel convinced that the last word has not yet been spoken on this subject, and there is much to be said in favour of the method, especially where the tar produced is not too viscous and heavily loaded with free carbon.

Returning to my text, I would like in conclusion to emphasize once more the importance of watching the pressures existing in the retorts themselves, and of making every effort to obtain these as constant as possible. I know full well the difficulty there is for the manager of a small works especially, to find the necessary time for attention to these matters—occupied as he is with so many other duties; but nevertheless I believe that the time so spent will be amply repaid, not only in improved results, but also eventually in economy of his own time, by reason of the resulting easier working in the retort-house itself, owing to the diminution of the troublesome epidemics of stopped pipes, thick tar in mains, &c., which occupy such a large portion of his time, and often at the period when he can least spare it.

* See "JOURNAL," Vol. XXX. (1877), p. 221.

* The arrangement here referred to was described and illustrated in the "JOURNAL" for April 9, 1907, p. 103.

METHODS OF CHARGING FOR GAS.

By J. F. TYNDALL, of Wicklow.

[A Paper read before the Irish Association of Gas Managers, Aug. 11.]

Two distinct branches of the gas business are now-a-days assuming commanding attention—viz., manufacture and distribution. It is very necessary that we should keep ourselves posted up-to-date on all modern methods of manufacture; but it is equally necessary—and probably applies more forcibly to us in Ireland labouring with small plant units, high costs, and selling prices—that we should be posted on the best means of selling gas. Distribution may be subdivided into the engineering and commercial sections; and it is along the commercial section that the author proposes to draw your attention in this paper.

Those of you who had the privilege of listening to the two rousing papers by Mr. Goodenough and Mr. Tooms, in June, 1907, at the Institution of Gas Engineers meeting in Dublin, must have concluded that there could be little left to talk about at so early a date on commercial lines. There is one point, however, which seems for the present to have been left in abeyance—that is, the method of charging for gas. This question has been raised in different forms at different times, and many wars have raged around the rights and wrongs of differential prices of gas. But each member has probably followed his own opinion, more or less bound by custom, or old-fashioned Acts of Parliament, bearing conditions which prevailed at a time when gas was practically a monopoly. The commercial spirit, however, has of late years entered more fully into the selling price of gas; hence we find that the advent of the gas-cooker demanded a differential rate wherever gas sold at 5s. per 1000 cubic feet and upwards.

The suction-gas plant and engine has had almost a clear field so far as Ireland is concerned; but we find our colleagues in England competing at cutting rates for this business. The gas-fire now courts our favours, with a suggestion of further reduction in price of gas for this development.

With very few exceptions do we find any strong advocates of an "all one price" system, nor in the author's opinion is such a policy commercially sound. Probably, however, in no other sales business except our competitor electricity do such illogical and diverse methods exist for charges as in our own. A glance at only one instance (see "JOURNAL OF GAS LIGHTING" for May 19 last, p. 419) will show to what extent a juggling of methods of charging for electricity exists, while an analysis of the Irish Section of the "Gas World Year-Book Directory" for 1908, discloses the following particulars: It shows 111 recorded works, and 110 recorded prices of ordinary meter supply. Of these, 38 charge only one price, and 72 charge two or more prices. Of the 38 charging one price, only 6 allow a discount, 32 charging net. Of the 72 charging two or more prices

33	differentiate	between	lighting	and engines-cooking.
12	,,	,,	,,	cooking and engines.
18	,,	,,	,,	engines only.
5	,,	,,	,,	cooking only.
8	,,	for lighting and are partly included in some of above.		

Of the differential prices between highest and lowest, one charges 1d. difference, two 2d., two 3d., one 3½d., four 5d., three 6d., one 6½d., four 8d., five 9d., one 9½d., thirteen 10d., four 1s., one 1s. 0½d., three 1s. 1d., one 1s. 2d., eight 1s. 3d., one 1s. 4d., two 1s. 6d., five 1s. 8d., one 1s. 10d., one 2s. 1d., one 2s. 2d., two 2s. 4d., one 2s. 6d., one 3s. 9d., and one 4s. Three actually charge 2d. more for cooking than lighting. On the single charge prices, six allow discounts, and on the double prices five allow discounts, as follows: 8 for lighting only, 3 for engines only; 85 undertakings supply slot meters, of which 16 make no extra charge, 50 do make an extra charge, and 19 are unrecorded.

Now, considering these 110 works are all making the same commodity, does it not seem strange, from a commercial standpoint, that so many methods of charging for it should exist? Or who will seriously state that he can profitably sell gas at such a difference in price as 4s. per 1000 cubic feet? Is it any wonder the general public whom we serve cannot understand our methods of charge and look upon all gas supply authorities with more or less suspicion? The consumer who uses £50 worth of gas for lighting is staggered when his neighbour, who uses £10 worth for cooking or engine purposes, receives it at a 20 or 25 per cent. reduction; it is something so antagonistic to established rules of commerce. In most sales transactions a general principle underlies all business—that for a given quality of goods a cheaper rate is offered for quantity, irrespective for what purpose the goods are used, and a special inducement for prompt payment. This principle, the author ventures to suggest, should be applied to the sale of gas. We are all victims of circumstance or custom, and exactly how much of each attaches to the gas business, it would be difficult to define.

The "all one price" system is, in the author's opinion, commercially unsound, but has much in its favour when compared with some systems of differentiation. Without plodding through the many and various forms which apply to two or more prices for gas, they may be broadly classed as an endeavour to raise the day load on the plant and staff, which must exist to meet maximum demands. Mr. Meunier, of Stockport, in his presidential address to the Manchester District Institution of Gas Engineers,* gave a masterly exposition of different classes of gas consumers, and the relation of their periods of consumption to the maximum possibilities of his plant. But his greatest difference in price between highest and lowest only came out at 10d., and that only when the apparatus for which the cheaper rate was allowed was worked to its maximum capacity. His average rebate was 6d. Mr. Napier, of Alloa, in his presidential address to the "Informal Meeting" of Scottish Gas Managers†, took a line very similar to the author's, except that he applied it solely for industrial purposes, thus—

Consumption per annum, lighting rate	2s. 2d. per 1000 cubic feet
Up to 400,000 cubic feet	2s. 0d. ,, ,,
400,000 and up to 750,000	1s. 10d. ,, ,,
750,000 ,, ,, 1,250,000	1s. 8d. ,, ,,
Above 1,250,000	1s. 6d. ,, ,,

These prices are based on net cost at consumers' meters. The general argument put forward is that as plant and staff have to be provided for the maximum demand, which is lighting, any surplus that can be made over the normal demand, and without increasing staff or plant, should bear purely the cost of coal. This is not a fair argument, and is exploiting one class of customer at the expense of the other. Moreover, the class exploited are the original backbone of the business, and one that even to-day cannot be ignored, but should have equal consideration. When a low price is set for a special purpose (usually cooking, heating, or power), proportionate working costs and capital charges should be borne by that class, which, in turn, should react by reducing the productive costs of the lighting class, and, in consequence, a reduced selling price all round. Were it not for the plant being provided in the first place by the lighting consumer, the cooking, heating, or power consumer could not have this low rate. Therefore, while the new love receives immediate benefit of a low rate, a due proportion of working costs should be debited to that rate, according to consumption, which in direct proportion should relieve the higher rate.

In stating these views, the author has been told nothing is lost by these low rates. Well, even granted so, if nothing is lost, certainly no profit is made. Therefore the higher-rated customer has to make all profits, with the added capital charges of new stoves, meters, services, and mains, while also supplying and maintaining the means of the low-rate service. But the difficulties do not cease here; the whole question is pregnant with anomalies. While pressing these very low rate schemes and maintaining a high lighting rate, has it ever occurred to you what are the possibilities? Does it not strike you that a position can be developed where your average profits will be so involuntarily reduced that only recourse to raising the price of gas can balance the situation? If economical incandescent lighting on the high rate be pushed on the one hand, and gas cooking, heating, and power at low rates on the other, the situation is easily possible. Take Zurich for example, where the meters in use represented 31 per cent. lighting, 0·5 per cent. technical, 0·5 per cent. engines, and 68 per cent. cooking and heating; and reference to the "JOURNAL OF GAS LIGHTING" for May 19 last, p. 419, will show our electrical friends in a similar plight.

Take the gas-fire class of claimants—a business principally in vogue in winter, therefore the least wanted, and if developed to any extent it must to a considerable degree overlap lighting. This class, then, is least entitled to rebates. The cooker class, however, forms a valuable summer consumption, but also to a certain extent overlaps the lighting, especially in large houses, hotels, and restaurants. The engine class is open to the greatest anomaly, two cases of which came directly under the author's experience. In town A, with a lighting rate of 6s. 8d. per 1000 cubic feet, and 4s. 7d. per 1000 for cooking, heating, or engines, a mill merchant installed suction-gas plant and two engines—the smaller to drive an electric dynamo for lighting his premises. Town gas was laid on to the latter engine as an emergency stand-by, and frequently the stand-by was the driving force, to such an extent that over 20,000 cubic feet were regularly registered per quarter—all at the 4s. 7d. rate, and all at a time when gas lighting was at its peak-load. In town B, with a lighting rate of 4s. 2d. and cooking, &c., rate of 3s. 9d., a large grocery establishment ran an electric dynamo off a gas-engine for lighting the premises—also on the low rate, and also when gas lighting was at its peak-load.

Now, gas managers make no secret of the fact that a gas-engine driven dynamo can generate electricity cheaper than a steam-driven one, or cheaper than a supply authority can distribute it from a central station. Mr. Carter, of Dublin, in his paper on "Suction Gas Plants," read before the South East of Ireland Gas Association on April 30,* gave the following cost of generating a unit of electricity: With coal gas at 2s. per 1000 cubic feet, 0·55d.; at 2s. 6d., 0·69d.; at 3s., 0·83d.; at 3s. 6d., 0·96d.; at 4s., 1·10d.; at 4s. 6d., 1·26d.; at 5s., 1·38d. What, then, is to prevent our best lighting consumers giving up gas lighting at 5s. per 1000 cubic feet and generate electricity by gas-engine at 4s. per 1000 cubic feet? The relative value at these prices would be electricity costing 1·10d. per unit, would allow 24 hours use of an up-to-date 32-candle power Osram lamp using 1·3 watts per candle hour; while a 30-candle power bijou gas-burner, using 1·25 cubic feet of gas per hour, at 5s. per 1000 feet, will only run 13·6 hours for the same money—omitting any capital charges on the electric plant. Chaos and inconsistencies abound; and the sooner we put our house in order the better. Differentiate by all means; but do so from a common basis irrespective of the purpose for which the gas is used. Follow established commercial lines, by which the largest customer secures the benefit of his large requirements, and so induce him to go further.

To this end, the author's remedy for the evil is to set a standard quantity of gas to be consumed, up to which a standard price prevails; afterwards, and in definite quantities, discounts from 5 to 25 per cent. would prevail, and a special discount for prompt payment. The necessary details of amounts would be solved individually, as no two works are in similar circumstances; but the principle for which the author pleads would be established. As an illustration of how the proposal would be adopted, the author might cite his own undertaking; and incidentally it shows to what extent circumstances enter into the argument.

A little over eighteen months ago, it became imperative to reconstruct the Wicklow Gas-Works. At the time the prevailing prices were: Lighting 5s. 6d. per 1000 cubic feet, engines 4s. 4d., and cooking 4s. Only three cookers were in use, as they were not hired. A few figures taken from the weekly returns for the week ending April 26, 1907, show the relative position of day and night consumptions. Week's issue, 79,200 cubic feet. The day output represented 14,700 cubic feet, or 18·56 per cent. of issue; night issue, 64,500 cubic feet, or 81·44 per cent.

Naturally in the reconstruction scheme, reserve plant was installed to a reasonable degree of what could be looked for by way of increased business. Cookers were hired and became popular. Facing a rising coal market and works reconstruction charges, the selling price came under review. It was decided to let old prices remain to existing consumers; but new prices were set for all new business, and with a definite purpose in view. The lighting rate of 5s. 6d. per 1000 cubic feet remained; but a differential rate of 4s. 9d. was set for all cooking, heating, or power business. In setting this differential rate of 4s. 9d., it was with the definite object of inducing day-loads, and by so spreading the working costs apply any possible reductions to the lighting rate till it touched the 4s. 9d. rate. The result of this policy is reflected

* See "JOURNAL," Vol. LXXXIX, p. 571.
† *Ibid.*, Vol. XCVIII., p. 95.

* See "JOURNAL," Vol. CII., p. 433.

in the figures taken from the weekly returns corresponding to a year ago—viz., April 24, 1908, and are as follows: Week's issue, 125,600 cubic feet. The day issue represented 47,100 cubic feet, or 37·50 per cent.; night issue, 78,500 cubic feet, or 62·50 per cent.—an increase on the day issue of 32,400 cubic feet, or 220·40 per cent., and an increase on the night issue of 14,000 cubic feet, or 21·70 per cent. During a week in June, the day consumption has gone up to 48 per cent. When the differential rate has been reached, the author is prepared to advise the adoption of his proposed change in method of charging. His Board were enabled at end of the March quarter this year to make a reduction of 3d. per 1000 cubic feet on the lighting rate.

Now, this system, the author maintains to be the real consistent course to adopt in the differential setting of prices, &c., not, as is sometimes done, perpetually keeping large differences of prices between the different classes of consumers as shown by the analysis quoted early in the paper. It should be borne in mind that this cheap rate really attracts new customers, who get an immediate relief in price, besides creating an involuntary reduction of average receipts for gas sold. Therefore it is only right that if this new business reduces working costs, the original backbone of the business struggling along at the high rate should share the benefit. To those of you in similar circumstances, the author would recommend this course; but keep in mind the broad and consistent method of cheap rate to quantity demand irrespective of purpose.

The slot consumer has not entered into these calculations at all so far. As a general rule, this class receives an installation of meter, lights, and very often a cooker, free of charge. This is in distinct contrast to the ordinary consumer, who pays meter-rent, cooker-rent, and buys his fittings. It is only reasonable, therefore, that, in addition to the price of gas, the hire charges of the installation should be added to the costs, having due regard to the fact that it is a cash sale, but often a troublesome and expensive one, as a recent paper to the North of England Gas Association showed, and for which due allowance should be made. The whole point to be sledge-hammered home is to get rid of the gas-must-be-used idea. Gas is a commercial commodity in competition for its existence on merit alone. It is trifling with the question to say that the higher-rated consumer is not injured by the lower price. If the price charged on the lower scale for certain business is a commercial and profitable one, then that same price should be so for other purposes. There is, however, a direct injury; for the low price charged shows conclusively that if this price did not exist, a uniform price, lower than that on the higher scale, could be charged over the whole business.

Discussion.

The PRESIDENT said that Mr. Tyndall had put the question of differential prices very clearly before the meeting, and had made out a good case for it. He had given them figures with reference to the charges in some parts of Ireland for gas for lighting and for cookers and fires. In one of the instances cited, there was a difference of 4s. per 1000 cubic feet—that was, a charge of 4s. less for cooking than for lighting purposes. He wondered what the price of gas for lighting was? He himself would consider 4s. a high price for any purpose. In another town mentioned there was a difference of 3s. 9d. He thought that if a consumer who used gas for lighting knew that it could be got for 4s. less for cooking and heating, he must surely think that the Gas Company could afford to give it for lighting at a lower price, because, as Mr. Tyndall pointed out, lighting was the backbone of their business. It was for lighting purposes that gas-works were established. But Mr. Tyndall went on to say that gas-fire consumers got too great a concession, because they came on in the middle of winter, when gas-works were working to their extreme limit. He would not agree with that at all. He himself was always glad to get a consumer, no matter what he did with the gas. It was one of the sides of the question they had not developed in Holywood, but which they were about to develop; and in Mr. Tyndall's paper he had got a number of valuable hints regarding the way to deal with consumers who wished to use fires. He believed there should be a differential price. He himself charged the same price to all; but he thought that, supposing they dropped the price of gas for fires by 1s. per 1000 cubic feet, they could afford to do this, and when the consumption had increased by so much, they could afford to reduce it all round by 1s. To reduce it, however, for fires and cookers by 4s. per 1000 cubic feet, charging perhaps 6s. for lighting, looked to be too great a difference.

Mr. W. H. ROBERTS (Newtownards), being an advocate of differential prices, said he would like to ask Mr. Tyndall if he would consider it reasonable that the consumer of gas for power should pay a larger profit per 1000 cubic feet than he would expect the consumer for lighting to pay. Mr. Tyndall advocated large consumers getting a percentage of reduction. Did he take into consideration that a manufacturer burned in mid-winter almost the whole of the gas he used? His idea was that gas for power could, and was, manufactured under cheaper conditions than for lighting, and therefore should be supplied at a cheaper rate. Regarding capital charges alone, a works supplying gas in equal proportions for both trade and lighting were capable of an annual output equal to double what they could do for lighting only—thus reducing the capital per 1000 cubic feet by one-half what it would otherwise be. He would like to know whether Mr. Tyndall meant, by the large consumer he spoke of, the gas used for factory lighting, and if he were aware that the capital required to manufacture gas for factory lighting would be equal to five times that which would be required for the same amount per annum for a gas-engine, where the load was equally divided over the year; or, in other words, if the annual capital charge per 1000 cubic feet for a gas-engine amounted to 6d., the charge would, in the case of a factory, be 2s. 6d. He had always advocated that they should charge more to factory consumers than to others. At Newtownards, seven or eight years ago, the price of gas was the same to all, with a discount to large consumers. There was little gas used for anything but lighting. They wanted to push the use of gas for power purposes; and they made the price for power 1s. lower than for lighting. Since doing so their output had almost trebled; but the maximum make per day had only increased by about 50 per cent.—thus showing, again, that capital charges were very little affected by trade purposes, and that they were not much benefited by the sale of gas for power. Seven or eight years ago he felt he was working to the maximum capacity of the works; but he was now putting out much more gas, and had little or no difficulty in keeping up the supply at the present point. He thought that careful consideration should be given to this—that, in making a differential rate, they were not really giving the gas at practically cost price for trade purposes.

Mr. R. BRUCE ANDERSON (Westminster) said the question was one in which he took a great interest. They would remember that some years ago he read a paper before the Association on differential prices. The difficulty which directors of small gas-works had to meet was that they did not see their way to allow large reductions so as to make them pay. The President had told them how the large reductions he had made had met with their reward. He made an enormous reduction in revenue; and it was only by reducing the price of gas so as to ensure a quantity being taken that he was able to recoup himself for the reduction. In his opinion, it was best to find out the idiosyncrasy of the individual manager. Everyone should be allowed to adopt that which best suited him. The case mentioned, where there was a differential price of 4s. per 1000 cubic feet, was a special one. The man who was supplied had a sawmill next door to the gas-works. It was rather unfair that figures of this sort should be published without explanation, to be taken hold of by consumers and used as a lever upon them for the reduction of the price of gas. They might have a customer a mile away from the works, to supply whom they had to put pressure on the whole district; whereas, in the case referred to, the man required no extra pressure at all. Differential prices were all a question of fair argument. It was, in his opinion, entirely a matter of expediency. They could not have a big differential price which they could justify; they could justify it only by striking all the capital charges off the gas. They might supply gas at a lower figure if they could square the difference with the other consumption, but otherwise they could not justify it as a fair argument at all. Any justification they attempted must simply be a plausible argument. Mr. Tyndall rightly drew attention to the economy in using incandescent gas lighting. The electricity people were experiencing a difficulty in much the same way. Those of them who had been charging low prices for motor purposes were finding that, with the Osram lamps which had been introduced, they would have to raise their prices. The author feared that some consumers would take gas at the cheap rate and use it in a gas-engine to drive a dynamo. His own opinion was that the more who did so, the better it would be for them, because if they had a shop well lighted by means of Osram lamps, it had a fine effect, and it was a lesson for everybody as to the lighting of shops. And if people could not get their places lighted by electricity, they would go to the gas manager and get him to improve their lighting. If they lost a little by the Osram lamp, they would gain a good deal in gas consumption. He objected to the method suggested, of setting up a standard quantity for gas consumption, with a discount following, as it prejudiced small people, who were excluded altogether; and then they had, to a certain extent, a justifiable grievance. Any scheme which they might adopt should be applicable to poor and rich alike. He took objection altogether to discounts for prompt payments. Long experience had proved to him they were an unmitigated nuisance. With respect to the amount of differentiation which was justifiable, he would refer them to a communicated article by Sir George Livesey, published a few years ago, in which he went very closely into the matter, and showed that a small differentiation was quite justifiable from economical considerations. He did not think that anyone could controvert his figures. He arrived at the conclusion that a very small discount was allowable—he thought about 2½ per cent. That was so small that it was hardly worth while complicating the books by giving. It practically tempted nobody to consume gas. With respect to the large differences in price for cooking, he thought that they were a survival of what was necessary 15 or 20 years ago. Then there were hardly any gas-cookers in use; and to tempt people to use them they had to give a very large reduction in price. Nowadays they had he did not know how many thousands being advertised all round the country, and they did not require to tempt consumers with the big difference in price which was formerly necessary. The author suggested that some addition should be made to the charge for gas supplied to slot-meter consumers. His own idea with regard to this was that they must try to give slot-meter consumers gas at as low a price as they could. If they put an extra charge upon slot consumers, they checked the consumption. He believed in the tabulated consumption system he brought before them ten or twelve years

ago. He then suggested that, instead of duplicating prices, they should strike a scale, and simply charge a lower rate for gas consumed in excess of the tabulated rate. By doing this they got rid of all double meters and pipes in houses; and the capital cost was also less. Companies who tried a small differentiated price did not get the consumption they expected. There were, he admitted, a lot of objections to the tabulated scheme, and in some cases where it had been worked, or intended to be worked, it had been "botched." In some towns they were introducing it by having two prices not very far apart. If they had an increase of 30 per cent. in the consumption, that would shortly enable them to reduce the high price to the low; and then they would be in a position to make a further reduction, or to cater for fires and the like. If they divided their revenue by the sale of gas, getting the average price, and took that as the selling price, they would not sell anything like the same quantity of gas if they reduced to the average as they would do by having two prices and gradually bringing down the higher charge. They would not sell anything like so much as if they maintained the high price, and had a low price tempting consumption. They ought to maintain the high price along with the low price; and ultimately they would be able to bring the high price down.

The Hon. Secretary said he must confess that he was an advocate of level prices. He had always thought that differential prices were more or less of an absurdity. He had sometimes fancied that if he were to ask a tailor for a suit of clothes, and the tailor were to say that if he wanted a Sunday suit the cloth would be 10s. a yard, but if it were an every-day suit the cloth would be 7s. 6d. a yard—that would be differential prices. If low prices did not exist, the uniform price charged for all purposes would be less than the higher price under a differentiated scale. While this was his sentiment, he must admit that it was not always the sentiment of one's directors. He was accordingly giving a discount of 10 per cent. on gas used in engines. This was not a thing he cordially agreed with, but it was done. Otherwise his price was a level one—the same to slot meter as to ordinary meter consumers. Differential prices had always raised the bogey in his eyes of the double meter and the double set of pipes that Mr. Anderson had spoken of. Mr. Anderson got rid of the trouble by the peculiar system which he explained to them some years ago; but it seemed to him that the one system was just as bad as the other, because if they had no duplicate meters or pipes, they must have duplicate books and clerks and so on, which must complicate the book-keeping greatly; and in a small gas concern this was not desirable. He thought they should aim at selling gas at the lowest price they possibly could, and put everybody on the same footing.

Mr. Tyndall, in replying on the discussion, said he was rather disappointed at the reception of the paper, because he thought it was a subject upon which there was a variety of opinion. With the exception of Mr. Whimster—and he was not quite a "whole hogger"—they were nearly all agreed upon differential prices. It was a question of degree. There was no getting beyond the fact that if they could charge one customer 2s. 6d., and have a profit, and they charged another customer 3s. 6d., they had a bigger profit off him. It was a great twisting of conscience to give a large differential price, because it cost as much to make the gas in the one case as in the other. They had to have the plant with which to make it, and they used their reserve plant to enable them to make gas to be supplied at the cheap rate; and then they turned to the high-rate customer and wanted him to provide them with further reserve plant. To his mind this was just a wriggling with prices, and the best way was to sweep the whole thing out, and to sell gas according to the quantity used. This was the object he had in view in bringing the paper before them. There was evidently a great deal of agreement over the matter, and it was only a question of degree as to how far differential prices could be applied.

Comparative tests under varied conditions carried out by Herr Gieseler have shown, according to a paragraph in the "Journal of the Society of Chemical Industry," that to prevent the rusting of iron, slaked lime applied as a coating, 3 to 4 mm. thick, is more effective than vaseline, linseed oil, and many of the special so-called rust-preventing paints.

In the "Journal" for the 28th ult., we gave the names of the prize winners at the last gas examinations. We are pleased to learn, from the current number of the "Co-Partnership Journal" of the South Metropolitan Gas Company, that several of the employees passed in the Ordinary Grade in "Gas Supply," and that two—Mr. E. S. Durward and Mr. H. E. Morgan—gained the second and third prizes in that grade.

In the "Journal" for the 23rd of June (p. 842), we gave some particulars of a new illuminating and heating gas produced by Herr Blau, a Bavarian chemist, which it was stated could be filled into cylinders and transported. According to the Chicago Correspondent of a London evening paper, the Blaugas Company have purchased ground in that city for the construction of works to manufacture the gas, which is expected to be soon put on the market, not only there but in England. The correspondent says: "The product will be peddled in bottles from door to door, like milk. Each house or apartment may have its own gas plant, and the dweller may run his own lines from retort to lamps, burn as much or as little gas as he cares to, and when his supply runs out he may get another bottle at the nearest store."

THE NEW GAS-WORKS AT BRESLAU.

A full description by Herr Wirtz, of Breslau, of the extensive new gas-works of the Breslau Corporation, was presented at the last annual meeting of the District Association of Gas and Water Engineers of Silesia. It has been published in a recent issue of the "Journal für Gasbeleuchtung," and a few of the more important particulars may be quoted.

Up to 1904, Breslau had three gas-works, of which the total productive capacity was about 114,000 cubic metres (4,026,000 cubic feet) per diem. It was evident that an extension was absolutely necessary for the year 1905; and it was ultimately decided to enlarge the first of the three works to a small extent, to meet the immediate needs, and then proceed to the erection of new works in the Dürrgoy quarter. It is to these new works, now completed, that the following particulars apply.

The retort-house is 75 metres long and 36 metres wide (246 feet by 118 feet) inside measurement, and contains 30 settings, each comprising nine 5-metre (16·4 feet) inclined retorts. The settings are in benches of five—three on each side of the retort-house—and the retorts are set at an angle of 32°. A coal-reservoir extends over the whole length of the building, and contains a sufficient quantity for from 18 to 20 hours' working, so that no coal is brought into the house at night. The coke is removed by means of De Brouwer conveying troughs. The total productive capacity of the retort installation is 135,000 cubic metres (4,768,000 cubic feet) per diem, of which about 10 per cent. will always be in reserve. The retorts are arranged for the introduction of water gas if desired. The coal-store is alongside the retort-house, and covers an area of 4500 square metres (48,438 square feet). The rest of the manufacturing plant is arranged in two sections, each adapted to deal with 60,000 cubic metres (2,120,000 cubic feet) per diem. The condensers are of the vertical water-cooled tubular type. The tar-extractors are on the Drory system, and are followed by naphthalene and cyanogen washers. The purifiers comprise two sets, each of four vessels 10 by 14 metres (32·8 ft. by 46 ft.).

There are two 3-lift gasholders, each of a capacity of 110,000 cubic metres (3,885,000 cubic feet). The tanks are 65·6 metres in diameter and 12·3 metres deep (215 ft. by 40 ft.), and are the largest steel tanks hitherto constructed on the Continent. The holder when fully extended reaches a height of 55 metres (180 feet). The total weight of iron in each holder is 1962 metric tons. There are two sets of water-gas plant on the Dellwik-Fleischer system, each having a productive capacity of 15,000 cubic metres (530,000 cubic feet) per diem.

An interesting point in connection with the erection of the plant on these works is the rapidity with which it was carried out. For example, the whole time occupied in building the gasholders, including the foundations, was only ten months.

There are for works' use two "fireless" locomotives. This type of locomotive, which is also in use at the Tegel Gas-Works, in Berlin, has a water reservoir of 350 cubic feet capacity, which contains about 280 cubic feet of hot water. It is charged at a stand-pipe alongside the engine-house with about 2000 lbs. of steam at 10 atmospheres pressure. The reservoir is thoroughly jacketed. A freshly-charged locomotive is capable of drawing a load of 64 tons a distance of 10 miles, and of attaining a speed of over 12 miles per hour. After standing in the locomotive shed for 36 hours, it can still run a mile to the engine-house to take up a fresh charge of steam. The "fireless" type of locomotive, in addition to being safe in all parts of a gas-works, has the advantage of requiring only one attendant (the driver), and of being ready for work at a moment's notice.

A NEW PREPAYMENT METER MONEY-BOX.

Robberies from prepayment gas-meters appear, according to recent information, to be growing considerably in many districts. This growth points to the necessity of considering well all and every means presented by the ingenuity of inventors for preventing these depredations, the damage in connection with which costs in most cases, over a given period, more than the total of the money stolen. Strong money-boxes have been put before gas managers for consideration as a means for stamping out the evil; but the degree of favour bestowed upon them has been somewhat mixed.

In our "Register of Patents" on Feb. 12, 1907, we gave a brief description of a new device that Messrs. Parker and Jeffreys had invented for the prevention of robbery and damage. A sample of the arrangement has lately been sent for inspection by Mr. Jeffreys (of No. 142, East India Dock Road, Poplar); and in its design it shows much protective ingenuity. There is a substantially built outer case; and in this is put the money-box, which is in the form of a drawer, some 7 in. by 6 in. by nearly 1½ inches from side to side. Centrally at the back of the interior of the outer case is strongly riveted a cylinder projecting to within about a couple of inches from the front of the drawer entrance. A screw-thread is formed in the interior of this cylinder. In the money drawer or box a cylinder is formed, into which the cylinder of the outer casing slides until it comes to a revolvable screw-shaft at the front inner side of the money-box. This revolvable shaft is connected to a movable disc let into the front of the box. On the

revolvable shaft (inside the front part of the money-box) is fixed a collar with teeth on its projecting periphery. Above this is a lock, the bolt of which at the end is also fashioned with teeth, which engage with those on the revolvable shaft, locking it in position, and so preventing it being turned.

These are the parts. Now as to their effect. The drawer is put into the casing, but it cannot be pushed right home. A small handle (capable of being taken about in the waistcoat pocket) is inserted in the movable disc on the front of the money-box and turned. The revolving cylinder screws into the fixed one in the outer casing; and when the drawer is quite home, the key (which is a peculiarly cut one) is inserted in the lock, the bolt of which is shot, and so, inside the box, the revolving shaft is held securely locked. Until it is unlocked again, there is no possibility of turning it. The lock is stated to be unpickable. When the collector calls, all he has to do is to use the lock-key, release the revolving shaft, and give a few turns with his small handle to the movable disc; and the money-box is drawn out. The whole can be done with the greatest facility and rapidity; but what is secured by the invention is a double-cased money-box, which is screw-locked in the centre of a cylinder carried in the interior of the money-box itself.

The inventors are not meter-makers, so that as yet the new box has not been applied to meters for sale; but no doubt they will be pleased enough to hear from any of our readers who are interested in the contrivance.

THE RATIONAL ANALYSIS OF CLAYS.

We have received from Dr. J. W. Mellor, of Tunstall, an advance proof of an article he has prepared, on "The Rational Analysis of Clays," for the forthcoming issue of the "Pottery Gazette." In it he deals at some length with the paper read by Mr. F. J. Bywater at the last meeting of the Institution of Gas Engineers, and, in view of the discussion to which the paper has given rise, we reproduce the portions of the article bearing upon the question.

Dr. Mellor begins by dealing with rational as compared with ultimate analyses of clays. He says it is the fashion among a certain section of clayworkers to belittle the ultimate analysis in vigorous terms; while the rational analysis is claimed to be the only satisfactory mode of representing the composition of a clay. He points out, however, that the ultimate analysis shows the proportions of the different elements in terms of their oxides—silica, alumina, lime, magnesia, &c. The rational analysis attempts to show how the different elements are combined together; and the composition of the clay is expressed in terms of clay substance—generally assumed to be kaolin—felspar, and quartz, or of clay substance, mica, felspar, quartz, free alumina, free iron oxide, free limestone, &c. It is claimed that the rational analysis furnishes the clayworker with an exact knowledge of the minerals which make up his clay. This information would be most valuable; but Dr. Mellor says it is not available. He contends that: (1) In the hands of experienced men the two leading methods adopted on the Continent for conducting the rational analysis of a clay frequently furnish results incompatible with an ultimate analysis of the same clay. (2) The ultimate analysis can be conducted with a great degree of precision. (3) Therefore, other things being equal, the rational analysis must be frequently erroneous. (4) The process cannot be recommended as a general method for comparing the properties of different types of clay. (5) Manufacturers of refractory materials are therefore more "rational" in presenting the results of an ultimate analysis than they would be in presenting the results of a rational analysis.

Proceeding to deal with Mr. Bywater's paper, Dr. Mellor says the author considers that the salvation of the fire-clay trade lies in the manufacturers carrying out a very complete series of investigations as to the real composition of their clays; ascertaining for each seam or pocket the proportions of felspar, quartz, and clay substance present, on the lines suggested many years ago by Seger and other scientific clayworkers, and by a series of actual tests, made on a sufficiently large scale, under men able to carry out the investigation with proper scientific accuracy. Dr. Mellor points out that Mr. Bywater writes as an experienced gas engineer, and says the part of his paper dealing with the wear and tear of gas-retorts and fire-bricks is, in consequence, a valuable contribution to this phase of the subject. He therefore uses the analyses published in the paper as a basis for his remarks, which we reproduce below.

The average composition of a modern Stourbridge clay is stated to be—

	Per Cent.
Silica	64·62
Alumina	21·65
Ferric oxide	1·48
Lime	1·88
Magnesia	0·62
Moisture	9·62
Total	99·87

A total deviation of 100·00 ± 0·5 represents the maximum usually permitted in clay analyses. Mr. Bywater claims that the reason this clay does not furnish satisfactory bricks is not revealed by this analysis. He says the analysis "gives no information as to the condition in which silica is present in the clay. It may exist as quartz, or in combination with alumina. . . ." An expert would see at once, assuming that the clay contains "true clay-substance, quartz, and felspar," that a large proportion of free silica—at least 30 per cent.—must be present. He could also state the approximate proportion of felspar if the ultimate analysis had been stated in full. The example quoted is particularly unfortunate, because the alkalies have not been determined, and the analysis is, in consequence, imperfect. The importance of the alkali determination is recognized by the author, since, in a later part of the paper, he says: "No brick should be accepted for use where high temperatures are to be withstood containing more than a total of 1 per cent. of potash and soda."

I feel sure that there is some confusion in certain parts of Mr. Bywater's paper between the composition of a fired brick and of an unfired clay, with its approximately 10 per cent. "loss on ignition." I mention this because the confusion likewise prevails in many of the (British) handbooks on the clayworker's art; but the fact has no particular bearing on the present argument, since if the fired brick is not to have more than 1 per cent. of alkalies, the limit for the unfired clay would be about 0·1 per cent. less than this.

I may also be permitted to express my doubt whether a single analysis—rational or ultimate—quoted in the paper is worth very much. No direct method for the determination of "alkalies" as such is known. The "alkalies" must be separated into "potash and soda" before a determination can be made. Had this been done, the result would, no doubt, have been stated in the table, because these data are of importance in estimating certain qualities of a clay. Again, most fire-clays contain about 2 per cent. of titanic oxide. This has obviously not been separated. I have not met a Stourbridge clay without this constituent. I doubt, therefore, if a clay expert would attempt to show why the clay in question makes unsatisfactory fire-bricks. This would not justify Mr. Bywater's charge as to the "futility" of ultimate analyses in general; but it does show the "futility" of slovenly analyses, ultimate or rational. However, this point does not affect the validity of my argument.

The method of calculation for transforming the ultimate analysis of a clay, so as to show "clay substance," "quartz," and "felspar," need not be elaborated here. The principle is described in any elementary text-book of chemistry. The bases can be calculated to the RO of felspar stated by Mr. Bywater to be RO Al_2O_3 $6SiO_2$. The corresponding silica and alumina are deducted from the total silica and alumina; and the remaining alumina can be calculated to clay substance, stated by Mr. Bywater to be Al_2O_3 $2SiO_2 + 2H_2O$.* The corresponding silica deducted from that left after the preceding operation furnishes the free "quartz." There is the pitfall. The multiplication of the "comparatively large" errors in the determination of small quantities of bases in the higher grade clays renders it necessary to label the process "approximate."

Can the rational analysis do more? Mr. Bywater gives a brief outline of the principle adopted in one method of conducting the rational analysis which is so well known that it need not be stated here. The next three analyses are quoted by Mr. Bywater to show that "clays may be similar in composition when analyzed by the one method, but entirely different by the other, or both may give similar results." The analyses quoted are—

Ultimate Analyses.

	"A." Per Cent.	"B." Per Cent.	"C." Per Cent.
SiO_2	60·49	62·52	56·14
Al_2O_3	26·10	25·57	30·99
FeO	2·11	0·92	0·80
CaO	trace	0·65	nil
MgO	0·56	0·10	0·27
Alkalies	1·08	1·04	0·78
Loss on ignition	9·80	9·27	11·27

Rational Analyses.

Clay substance	71·54	72·05	79·47
Quartz	25·97	27·78	18·92
Felspar	2·49	0·10	1·61

Is Mr. Bywater's condemnation of the ultimate analyses justified? Surely there is an appreciable difference in the ultimate analyses of any two of these clays. The rational analysis of the "B" clay furnished 0·10 per cent. of felspar. Under the condition least favourable for my argument, this corresponds with at most 0·017 per cent. of RO bases; yet the clay has 100 times this quantity of alkalies! And this without mentioning the 1·67 per cent. of additional bases FeO, CaO, and MgO. This number, 0·017, is absolutely incompatible with the 2·71 per cent. of the RO bases actually present. I may say, in passing, that this analysis was published sixteen years ago (1892) in the "Tonindustrie Zeitung" (Vol. XVI., p. 1031). The analysis was made in Germany; and it represents the composition of a German clay from a pit at Löthian, in Saxony. It makes no difference to the argument whether or not FeO be a misprint for Fe_2O_3. The rational analyses of clays "A" and "C" are likewise incompatible with the corresponding ultimate analyses. The felspar in the former corresponds at most with 0·4 per cent. of RO bases—actually 3·69 per cent. at present. It will not do to refer the discrepancy to "clay substance," because we should then be confronted with yet another incongruity.

* I assume, of course, that Mr. Bywater's Al_2O_3 $2SiO_2$ is a misprint.

On comparing a number of published analyses and reports two or three years ago, I found this sort of thing quite general. Here, for instance, is one selected at random from a report on some Shropshire clays by Mr. J. T. Norman (Sept. 25, 1903):—

Ultimate Analysis.

	Per Cent.
Free silica	27·19
Combined silica	32·11
Alumina	27·17
Ferric oxide	1·44
Lime	0·48
Magnesia	nil
Alkalies	0·52
Sulphur trioxide	1·40
Loss on ignition	9·67

Rational Analysis.

Kaolinite	43·74
Quartz	19·42
Felspathic matter	36·84

"Kaolinite" is here a term intended to be synonymous with "clay substance;" the "combined silica" probably means the silica which is combined as kaolin; and "free silica" that which is really "free" as well as that combined with the 36·84 per cent. of "felspathic matter." Without dwelling on this point, we see at once that 36·84 per cent. of "felspathic matter" in the rational analysis is quite incompatible with the RO bases in the ultimate analysis.

It is necessary to bear in mind: (1) The accuracy of the ultimate analysis within the limits indicated above has never been questioned; and (2) the journals are strewn with records of attempts to improve the old German process of rational analysis—suggested by G. Forchhammer (1835), and advocated by H. A. Seger—and make it applicable to clays in general, but with no marked success. The improvements involve so many debateable assumptions that I am very doubtful if it gives results so exact as those calculated as indicated above. Consequently, Mr. E. R. Buckley, in his "Report on the Clays and Clay Industries of Wisconsin" (1901), abandoned the rational analysis as being of "little significance," and calculated the mineralogical composition of the clays by a method similar in principle to the one just outlined. There is no known accurate process for the general determination of the exact mineralogical composition of clays; and I am not very sanguine of the discovery of such a process in the immediate future.

In capable hands, the method for conducting the ultimate analysis is very exact; whereas the method employed for the rational analysis is extremely faulty when applied to clays generally. The term "rational" is therefore somewhat misleading. When a process in the hands of an experienced analyst furnishes results similar to those just quoted, I claim, in all seriousness, that the process is irrational, misleading, and false. Possibly, Mr. Bywater will say that this is a problem for the chemists to settle. It certainly is. But until the chemists have perfected this objectionable process, it is scarcely fair to preach its great virtues.

This paper is a brief neither for nor against the methods in vogue for the manufacture of British or German fire-bricks. My remarks are directed solely against the idea that the process of rational analysis indicated by Mr. Bywater can be applied to fire-clays in general. If Brongniart, in 1840, had used some adjective other than "*rationnel*," this note might never have been written. The adjective is without doubt responsible for many of the virtues which writers claim for this irrational process.

Coal Prices.—"When our leading home railways show an increase in the half year of £500,000 for coal, it does not require much explanation," says the "Pall Mall Gazette," "to show that there are reasons for the reduction of dividends. Unfortunately, railways and gas companies alike do not yet see that decline in coal prices which commercial conditions would seem to warrant. The decline will come presently, but apparently the railways will have to wait for the full benefit."

Cost of Tar-Painting Roads in Kent.—The County Surveyor of Kent, in his annual report to the County Council, states that the bill for tar-painting the roads alone came to upwards of £3500, which was entirely due to motor-car traffic. This was the smallest part of the cost, as on the main trunk roads high-speed cars with armoured tyres continued to cause much damage of a peculiar nature. In all the Home Counties the Surveyors in their reports have referred to this new form of damage; and representations on the subject have been made to the President of the Local Government Board on behalf of eight of them.

Extensions at the Brussels Gas-Works.—Owing to the continued increase in the consumption of gas in Brussels, notwithstanding the competition of the electric light, the Gas Committee of the Municipality have found it necessary to extend the gas-works at Schaerbeek. A new bench of inclined retorts is being put up, and a gasholder of rather more than 2 million cubic feet capacity erected. The work will not be completed till next year. The holder, which is in three lifts, is about 196 feet in diameter and 115 feet high, and stands on a bed of concrete 3 ft. 3 in. thick laid on piles. It will cost, in round figures, £40,000, of which £26,600 will be for the metal portion.

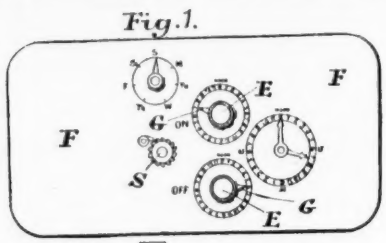
REGISTER OF PATENTS.

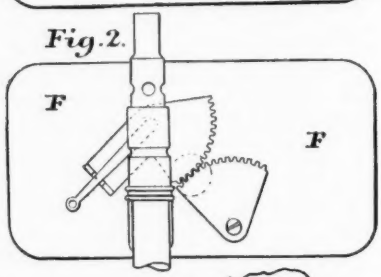
Automatically Operating Gas Taps at Predetermined Times.

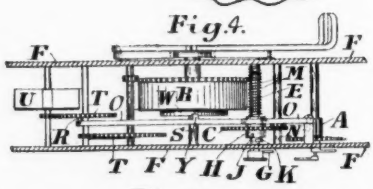
HARE, A., of Auckland, New Zealand.

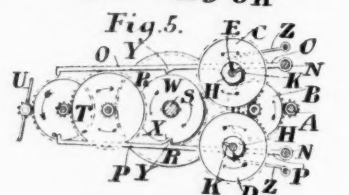
No. 16,862; July 23, 1907.

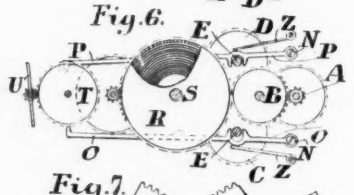
This invention relates to attachments by which gas cocks or valves may automatically shut off or open the supply of gas to a burner at stated predetermined times—a spring motor being released by levers operated by a pin-and-slot device as the clockwork revolves. The invention comprises means whereby the actuating apparatus for cutting-off the gas supply may be adjusted to operate at a later hour on succeeding nights for a period of days—thereby providing for lamps to which the appliances are fixed being turned off at a later hour each night during the week following a full moon; also mechanism by means of which the actuating apparatus may be prevented from turning on the gas supply upon one day of each week—thus providing for the use of the appliance upon the front lamps of shops, &c., on Sundays.

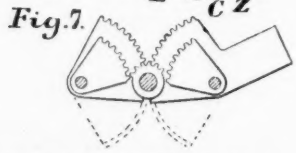












Hare's Lamp-Operating Device.

Fig. 1 is a back elevation of the appliance. Fig. 2 is a front elevation, shown in position with regard to a gas-burner control valve. Fig. 3 is a detail view showing the means whereby the actuating mechanism may be caused to operate the valve at a later hour each night. Fig. 4 is a bottom edge elevation of the appliance. Fig. 5 is a longitudinal section on the line 5 of fig. 4, looking in an upward direction.

Fig. 6 is a longitudinal sectional plan on the line 6 of fig. 4. Fig. 7 is an underneath plan of the valve-actuating appliances.

The means devised consist of clockwork mechanism driving an hour wheel A, so disposed as to make one complete revolution in twenty-four hours, instead of two, as in most clocks. Geared with this wheel, through intermediate wheels B, are a pair of wheels, C D, each geared so as to revolve at the same rate of speed as the hour wheel—that is, to make one complete revolution in twenty-four hours. These wheels are each loosely mounted on a spindle E that projects out through the back of a casing F containing the mechanism, and has attached to its outer end a pointer G adapted to move over a dial arranged to correspond to a clock dial marked on the face of the casing. One of these indicator pointers is employed for regulating the time at which the valve is to be opened, while the other regulates the time at which it is to be closed.

Each of the wheels C D is formed with a boss H upon its back face; and the back face of the boss is formed with a depression J. Each spindle E is provided with a pin K projecting radially from it between the casing and the surface of the boss H; and a flat spring L serves to keep the pin and spindle from movement as the boss revolves over it. Secured by a loose pivot connection to standards N, projecting from the back of the casing, are rods O P, which respectively extend across in front of the wheels C D and loosely encircle the spindles E. These rods are so pivoted to their standards as to be free to move a short amount laterally and circumferentially. Suitable bearing faces are formed on the wheels to permit of them revolving freely, although in engagement with the rods. A helical spring M surrounds each spindle and bears between the front faces of the respective rods O P and the inside of the front portion of the casing, so as to tend to keep such rods pressed backwards in close contact with the wheels they overlie.

As the wheels are caused to revolve by the revolution of the hour wheel of the clock mechanism, their bosses H slide around over the respective pins K until the depressions J therein reach such pins, when the springs M cause the rods O P to bear upon the wheels and press them backwards until the pins enter the depressions and cause lateral movement of the rods upon their pivots.

The point of the revolution of each wheel, and the consequent hour of the day or night at which this action shall take place, may be fixed (at will) by revolving the spindle C, so that its pointer shall coincide with the desired hour upon the dial, when the pin K, which is fixed upon the spindle so as to coincide with the pointer, assumes a corresponding position.

The depressions J are formed with a straight face, and with a face inclining upwards from the bottom of the depression to the periphery of the boss in the direction of rotation of the wheel to which the boss is attached; and the pins K are shaped of semi-circular form in cross section. This shaping of the depressions and the pin ensures that as the depression reaches the pin it shall pass instantaneously back over it, and as the revolution of the wheel continues the wheel is slowly forced forward again by the engagement of the inclined face of the depression with the pin, until it reaches its normal position. The respective rod O or P will also thus be forced back to its normal position.

A spring or motor actuated drum R, the tendency of which is to revolve in the direction of the arrows in fig. 5 is mounted upon a spindle S, extending across the casing and provided with means whereby it may be wound and retained in the wound condition. This drum is geared with a train of wheels T operating a governor vane U.

To the back face of the drum R is secured the disc W, the face of which is shown in fig. 5. This disc is formed with a notch or depression X in its periphery. The rods O and P pass one on each side of the disc, as shown in figs. 4 and 5. Each rod is provided with a projection Y adapted to engage with the notch X in the disc. The projections are kept in close contact with the periphery of the disc by springs Z, which bear against the outside faces of the rods and press them inwards towards the drum R. The rods O and P are continued along until their free extremities pass behind one of the train of wheels T, operated by the spring drum R. This wheel is provided with a pin projecting from its face, and adapted to engage with inwardly-turned ends of the rods extremities, so as to restrain the drum R from revolving under certain circumstances.

The front face of the drum is formed with a central extension or boss (figs. 4 and 7) which extends through the front of the casing, and has a segment of a pinion secured upon it. A pair of toothed arc pieces are mounted upon the face of the casing, and gear with each other. Each arc piece is provided with a toothed quadrant secured upon its underside, the teeth of which are adapted to be engaged by those of the pinion as it revolves with the drum R. The arc piece is formed with an extension beyond its pivot point, and provided with an upwardly-turned and forked end at its free extremity. The fork is adapted to receive the actuating lever of the gas-burner valve (as shown in fig. 2), so that as the arc piece, with its extension, is turned on its pivot, it will turn the lever with it.

In operation, supposing it is required to turn on the gas supply at 7 p.m., and turn it off again at 6 a.m., the respective spindles of the wheels C and D are turned until their indicators point to these times on the respective dials. The pins K will be correspondingly turned, so that as the wheels, in their revolution, cause the depression J to reach the pins, the respective rods O and P will be forced back, in the way described, when the right hours are reached by the clock with the works of which the invention is combined.

In their normal position, the levers O and P will be pressed forward, so that their turned-in extremities lie in the plane of the course of revolution of the pin upon the train of wheels T. The projections Y of the rods O and P are kept normally in engagement with the periphery of the disc W attached to the drum, so that one or other of such projections will always be in engagement with the notch X in the periphery of the disc, while the other projection and the rod to which it is connected are pushed outwards on the rod's pivot. Thus the extremity of the rod will be turned out to allow of the pin on the wheel train T passing it, while the other rod, by reason of its projection being in engagement with the notch in the disc W, will lie within the course of the pin and hold the wheels from revolving.

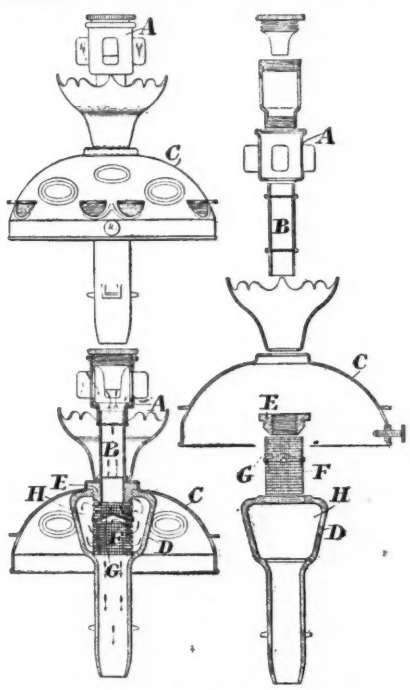
When this latter rod is pushed back as described, it will release the pin, so that the wheels T and drum R will be free to revolve under the action of the drum's spring; and the drum will revolve until the notch in the disc W comes opposite the projection Y on the other rod, when the projection, under the influence of the spring Z, springing in and engaging with the notch, allows the rod to which it is attached to move in so that its turned in extremity lies in the path of the pin on the train of wheels T, and prevents the train from acting and thus holds the drum from rotating further. The drum will, therefore, as it is released, make a complete half-revolution, which will cause the segmental pinion to engage with one of the quadrants and cause the arc piece to which it is attached to turn on its pivot, and thus, also, by reason of the two arc pieces gearing with each other, impart a turning movement to both of them.

When it is desired that the apparatus may be adjusted to shut off the supply of gas at a later hour on succeeding nights, the means shown in fig. 3 are provided. These means consist of a toothed quadrant secured upon the back end of the spindle E carrying the cutting-off actuating wheel. This quadrant is connected by intermediate gearing with the hour wheel A of the clockwork, and is so adjusted that it shall be caused to make one twenty-fourth of a revolution in every twenty-five hours, thereby causing the pointer G and pin K to move forward one hour in every twenty-five hours. Thus the hour at which the corresponding rod for freeing the mechanism will be moved will be at twenty-five hour intervals, instead of twenty-four, as ordinarily, until the quadrant is worked free from the gearing, when the normal condition will again prevail, and the cutting-off appliance will operate every twenty-four hours at intervals, from the hour to which the quadrant had moved the indicator. Thus in the week succeeding a full moon, the appliance may be set to turn off the supply on the first night (say) at nine o'clock, on the next night at ten o'clock, and so on, an hour later each night for a week, when 3 a.m. would be reached, after which the appliance would continue to act at that hour until it was further regulated.

Inverted Incandescent Gas-Burners.

WILLIAM CROSS AND SON, LTD., and KIRBY, J., of West Bromwich.
No. 20,330; Sept. 12, 1907.

This invention has for its objects to provide a burner with means for ensuring the thorough mixture of the gas and air prior to delivery to the ignition tube. The improvements are principally applicable to inverted burners where the gas and air are conveyed by an induction tube to a mixing-chamber from which the ignition tube depends, and which is arranged underneath a perforated hood or canopy to admit of the hot air and products of combustion from the mantle being utilized regeneratively by heating the mixture before it reaches the nozzle of the burner-tube, while the upper part of the induction tube has an air-regulator and a deflector-cone whereby the combustion products ascending through the perforations of the hood are deflected away from the air inlets of the regulator or prevented from being drawn into the induction tube.



Cross and Kirby's Inverted Gas-Burner.

The illustrations represent an elevation of such a burner constructed in accordance with this invention, and a complete vertical section through the burner—showing the special arrangement employed for effecting the complete incorporation of the gas and air; also the various component parts of the burner disassembled.

The air-regulator at the top of the burner is provided with a regulating sleeve A made from sheet metal and perforated with the usual inlet apertures, which are adapted to be brought more or less into register with the fixed air inlets; but in piercing out these apertures, the metal removed from two or more of them, instead of being completely detached from the sleeve, is left connected and intact down one side, and is set to project outwardly from the sleeve, so as to constitute finger-holds whereby the regulator may be quite conveniently manipulated.

The lower end of the induction-tube B, after passing through the crown of the hood or canopy C, is connected with the mixing-chamber D of the burner. This chamber is preferably made in the form of a taper-sided box or enlargement, the top of which is attached to the induction-tube, while the ignition-tube depends from the bottom. Within the chamber or enlargement, the mixing-device is fitted. The connection between the induction-tube and mixing-chamber is provided for by screwing the lower end of the tube B into a flanged ring or collar E, whose underside is preferably coned, and which is adapted to be screwed, in turn, into a wormed hole in the top of the mixing-chamber; so that when the parts are assembled, its coned bottom will project slightly into the chamber.

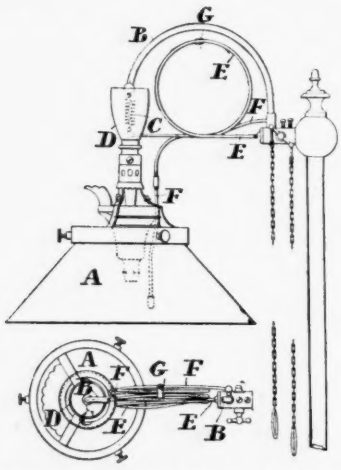
The mixing-device consists of a sleeve or tube F, composed of perforated metal gauze, arranged vertically within the mixing-chamber, with its upper end surrounding and enclosing the coned surface of the collar E, while its lower end is fitted into a seating surrounding the mouth or upper end of the ignition-tube. Directed horizontally across the sleeve is a preferably coned disc or diaphragm G whose apex is presented to the axis of the induction-tube, and which may be secured in position by ears or lugs passed through the gauze and clenched over. This coned disc is said to greatly help to prevent back-lighting. The arrangement provides an annular space H between the gauze sleeve and the walls of the mixing-chamber; and it follows that the streams of gas and air delivered by the induction-tube issue into the upper part of the gauze sleeve and impinge against the coned surface of the diaphragm whereby they are directed laterally through the perforations in the sleeve into the upper part of the annular space H, whence the mixture thereby produced, after impinging on the taper walls of the chamber, passes back through the gauze or perforations into the lower part of the sleeve and below the partition, which completes the incorporation of the mixture prior to its delivery into the ignition or burner tube, and brings the mixture into contact with the outlet walls of the chamber which are within the influence of the hot combustion products ascending from the burner, so that the "products are utilized most effectively for heating the mixture prior to combustion."

Inverted Incandescent Gas-Lamps.

How, S. J., of Clapham Park, S.W., and Sugg-Wright, E., of Regency Street, Westminster.

No. 27,455; Dec. 12, 1907.

According to this invention, separate pipes are employed for the main gas supply and flash-light, wound into parallel coils, so as to form a spring, before they are led off to the top of the burner and to the flash-light respectively. The coiled pipes partially support the weight of the lamp, which, however, is also partially supported from an arm or bracket by an ordinary "bird-cage" spring. The two pipes are coupled together at the coils by a clip, the position of which "gives a resiliency more or less great after the manner of the device for regulating the hair spring of a watch." The gas-tap is preferably of the kind which gives a temporarily elongated flame to the flash-light at the moment of ignition



How and Sugg-Wright's Inverted Gas-Lamps.

The lamp is suspended from the arm B by the bird-cage spring C enclosed in the cup-shaped shield D to protect it from heat. E is the gas-supply pipe to the burner, and F is the gas supply to the flash-light. These pipes are wound into coils so as to form springs, which are coupled together by the clip G.

Inverted incandescent lamps thus arranged can, it is said, be mounted with safety in places where there are considerable vibrations and shocks—such as on partitions and on railway bookstalls, and are very suitable for desks and counters where heavy ledgers and books are constantly being moved about.

Manufacture of Incandescent Mantles.

Lake, W. E.; a communication from Aktiengesellschaft für Selas-Beleuchtung, of Berlin.

No. 1852; Jan. 27, 1908.

The essential feature of this invention is that a tubular meshy tissue is laced up between its two ends and subsequently cut or divided in some similar manner. The method of cutting incandescent mantle-tubes into pieces of corresponding length, and lacing them together at one end, is already known. The novelty in the present invention is, however, that the lacing is done first, and then the separate parts of the tube are cut off. It will be seen, therefore, that the order of the previously known method is to a certain extent reversed; and various important advantages are said to be obtained. First, it is of the greatest importance that the incandescent mantle, during the process of lacing is well connected with the webbed tubing, from which it is cut off. Consequently the lacing of the tubing is made easy; and, in addition, it is possible to keep the tips of the finished mantle projecting over the lacing points very small. An economy in material may therefore be effected by the new method. The entire process of manufacture is also simplified, owing to the fact that several mantles are produced in a continuous row, and it is only necessary to always push up the webbed tubing, to lace it up and cut it off. The production of mantles consequently requires considerably less time than the methods previously employed.

Preparation of Incandescent Mantles.

Weickert, M., of Plauen, Saxony.

No. 2572; Feb. 5, 1908.

The patentee remarks that the attempts hitherto made for supplying to a consumer incandescence mantles in a condition which enables him to burn off or incinerate the mantle directly on the gas-burner while producing an incandescence mantle which sits faultlessly on the burner, have not been very successful; and to solve this problem is the object of the present invention.

A slight rigidity is imparted to the mantles in such a manner that they retain the necessary resistance to breakage, but are sufficiently stiff to remain in an upright position when mounted on the burner. This stiffness may be imparted to the mantles by adding to the liquid serving to impregnate the textile fabric a suitable stiffening substance—for instance, starch. Incandescence mantles treated in this manner need not be packed separately in cardboard tubes for transport—on the contrary, a considerable number of them may be mounted on a cardboard tube and sent off in this condition.

For incinerating the mantle directly on the burner, account has to be taken of the shrinkage or sintering of the body. For this purpose, the burner-fork serving to support the incandescent body is provided with a deeper fork-opening than that usually employed. The mantle to be burnt off is placed upright upon the burner, so that it stands in the lower part of it, and the asbestos eye of the mantle is at first situated in the upper part of the fork-opening, without finding any support in the fork. When the burner has been mounted on the bracket or in the lamp, the gas is lighted, thereby causing the immediate incineration of the mantle down to the upper edge of the burner top. The gas-tap is quickly closed again, and "in a few moments the mantle is found to have been completely calcined or burnt to ashes, both upward and downward." Owing to the shrinkage of the body during calcination, the eye slides down until it finds a support in the fork of the pin. The gas is now lighted, and the chimney mounted in its place, whereupon the mantle "immediately assumes its proper shape and a faultless luminosity, and will become hardened by the flame."

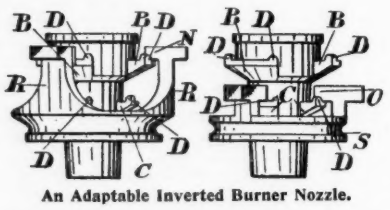
The adoption of the process here suggested is said to materially simplify the method of transport, and the cost of such incandescence bodies is reduced by avoiding the expensive impregnation (with shellac) and burning-off process. Just where the "invention" comes in is not apparent; but the patentee closes his specification thus: "It is not new to impart rigidity to an unburnt mantle by coating it with a suitable stiffening substance; and I do not therefore claim this feature generally." What he does specifically claim is: "The herein-described method of incinerating unshellacked and unburnt incandescence bodies, to which some rigidity has been imparted by means of a suitable stiffening substance, so as to make them capable of standing upright in the burner, which consists in using for the incineration of the incandescence bodies on the burner a burner-fork having a deeper fork-opening than usual, in order to afford to the asbestos-eye of the mantle the freedom of motion rendered necessary by the shrinkage connected with the incineration, for obtaining a sufficiently long and faultless body."

Nozzles for Inverted Gas-Burners.

Deutsche Gasglühlicht Aktiengesellschaft (Auer-gesellschaft), of Berlin.

No. 9286; April 29, 1908. Date claimed under International Convention, Nov. 19, 1907.

The object of this invention is so to construct the nozzle of an inverted incandescent gaslight as to adapt it to receive mantle-rings of any ordinary construction.



An Adaptable Inverted Burner Nozzle.

The first illustration shows in perspective the nozzle with a mantle-ring on it; the second shows the same nozzle with a mantle-ring of different construction in place.

The nozzle is provided with two sets of studs or projections, one B on the wide upper part of the nozzle, and another C on the lower narrower part. In the first instance, the ring R is shown suspended on the projections B by its inwardly extending studs N. The raised portions D of the studs prevent any shifting of the ring. In the second case, a ring S is suspended on the studs C by its projections O. The studs also have projections D to prevent any shifting of the ring in the usual manner.

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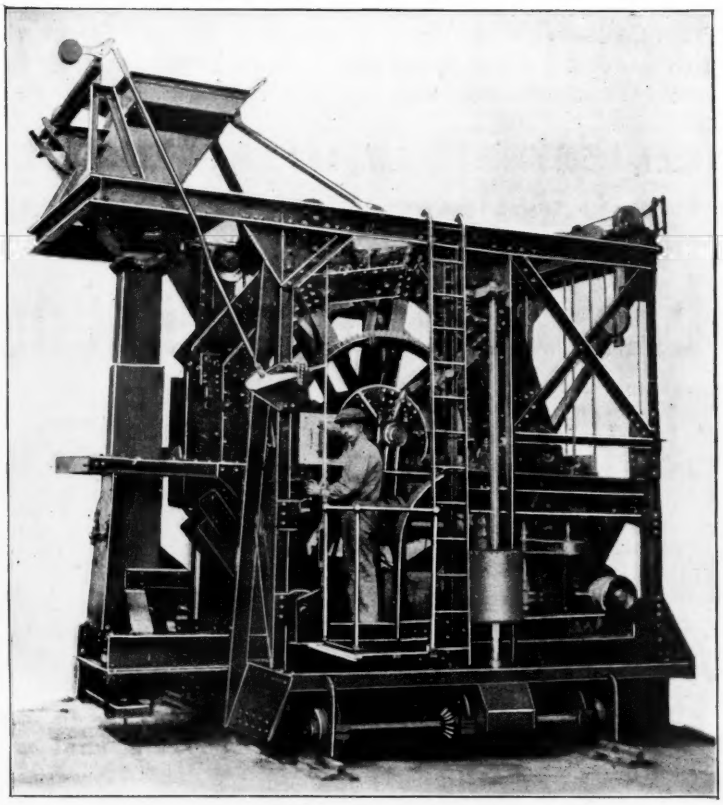

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SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Wednesday at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Sir GEORGE LIVESEY in the chair.

The SECRETARY (Mr. F. M'Leod) having read the advertisement convening the meeting and the minutes of the last ordinary and extraordinary general meetings, the seal of the Company was affixed to the Register of Proprietors, and the report and accounts (which have already appeared in the "JOURNAL") were taken as read.

A FULL MEETING—THE REPORT AND ACCOUNTS.

The CHAIRMAN: Ladies and Gentlemen, the first thing I have to say is to express our pleasure at seeing such a large meeting. It has rather surprised us, because as a rule in August the meetings are very thin; but I take it as an evidence of your interest in the Company, which is a very satisfactory matter to us all. I have to move—"That the report and accounts now presented be received, adopted, and entered in the minutes." The report and accounts are perhaps not exactly presented now. They have been presented by post; and no doubt you have all received a copy. Therefore we take the report as read. The report on this occasion contains only three paragraphs. We have usually had five or six; but there was not very much to speak about. The Directors are always anxious to give as much information as possible. These three paragraphs may be indexed. The first refers to profits, the second to expenditure, and the third to our co-partnership. We begin by saying that the accounts show a satisfactory amount of profit; and then we explain that we write off the suspense account deficiency of December and carry something to the next account. I must say I could have wished the profits had been more, for this reason, that had they been greater there would have been the great additional pleasure to the Directors of reducing the price of gas. Under the circumstances the profits do not warrant any reduction.

DEAR COAL AND HIGH COST OF DISTRIBUTION.

We have been trying very hard for many years to sell gas at the lowest possible rate; but circumstances have been very much against us. In dealing with the price of gas, I may perhaps go back to the year before the amalgamation of the three Southern Companies. The South Metropolitan Company in 1879-80 absorbed the Surrey Consumers' and the Phœnix Gas Companies; and since then the amalgamated Company has carried on the business. The average price charged by these three Companies in the year preceding the amalgamation was 3s. 3d. per 1000 cubic feet. That was in 1879. In 1889 we had got the price down to 2s. 3d.—a drop of 1s. in the ten years, which was exceedingly satisfactory. I confess that when we got down to 2s. 3d. my hopes were great that, in the course of the next ten years, we should see a considerably lower price; but here we are—2s. 3d. in 1889 and 2s. 3d. to-day. It is a serious matter. Nearly everything has got dearer. Expenses have gone up in many particulars; and the only material saving we have been able to effect has been in the dividend. It cost us in 1889 rather over 1s. per 1000 cubic feet to pay dividend and interest—I think it was 1s. 0·37d., nearly 1s. c½d.; and to-day it costs us 7½d. There has been a saving of something like 5d. per 1000 cubic feet in the cost of interest on capital; and yet we are selling gas to-day at the same price that we charged in 1889. Coal and labour are dearer, and, particularly, is distribution dearer. The cost of distribution in 1889 was less than 2d. per 1000 cubic feet, and now it is just under 5d. Then we have saved money by the adoption of machinery for our retort-house work. We have saved 1d. per 1000 cubic feet there. But notwithstanding these savings, it is matter for regret that we have not been able to reduce the price on this occasion—coal, rates, and expenses generally having become dearer. Hence our disappointment at not being able to come down as we had hoped twenty years ago. There is another point in the accounts I must allude to—that is the capital account. If you have looked at it, you will have seen that there is no addition to the capital account this year. Generally speaking, in order to meet the expenditure necessary to provide for the increase of business, the increase in the number of consumers, we have issued new capital at the beginning of the year. The June account of last year showed we had received £102,266 on capital account. This year we have received nothing.

CAPITAL ACCOUNT—RESERVE AND INSURANCE FUNDS.

We have felt that with a business that was not increasing at the ratio we have been accustomed to, it would never do to go on increasing capital. I am reminded on this occasion of our late friend, Sir William Makins, the Governor of the Gaslight and Coke Company, than whom I suppose there were very few better men to preside at a meeting. He generally had a reason to satisfy the shareholders; but on one occasion he was posed by a lady asking why they were increasing capital when the business was not increasing. There was no answer; nor is there any! We have no increase of capital on this occasion because there is no increase of business. In other respects, excepting only that we were not able to announce a reduction in price, we are very well satisfied with the profit we have earned. We have got rid of the suspense account, and we are reducing the large item in the last December account of £57,000 in respect of slot-meter fittings due to the Company. This is reduced to £37,000; and in the course of one or two half years it will disappear altogether. At any rate, I think that, with the exception that the price of gas is 2s. 3d., we may regard the condition of the Company as very satisfactory. Remember, we have these large reserve and insurance funds. They are not quite £300,000; but £296,000. This is what we have invested. The investments are perhaps not worth quite so much now; but the interest is accumulating, and in the course of a year or two they will amount to at least £300,000—the reserve and insurance funds being sufficient to meet contingencies.

UNACCOUNTED-FOR GAS.

A question has been raised in the papers during the last few days about unaccounted-for gas. In our case, the unaccounted-for gas is ridiculously low in this half year. Going back to December—it will never do to take a single half year—I find that the unaccounted-for gas amounted to 4¾ per cent.; and this June half year it is only ¾ per cent. You will say, What is the reason for this? Well, the reason is that in taking the indices of the consumers' meters about three weeks are occupied. If we could take all the consumers' meters on Dec. 31 and June 30, we should get an exact record of the gas consumption in the half year; but about two weeks of the consumption of the December half year goes into the June half year, and two weeks of the consumpton of the June half year goes into the December half year. As the consumption of December is about three times that of the June, the June half gets the benefit. Therefore it is necessary to take the average; and the average amounts to about 3 per cent. Well, now, I am speaking more for gas people. There is a difficulty in ascertaining the exact quantity of gas that is made, because it is measured at the temperature at which it leaves the purifiers, which may be considerably above that of the atmosphere. Therefore in measuring it by the large station meters, it is measured in a greater volume—the gas being at a higher temperature than when measured at the consumers' meters. For instance, there is 5 per cent. difference in the quantity of gas measured at a temperature of 60° and a temperature of 40°—1000 cubic feet measured at 40° would show as 1050 feet measured at 60°. Therefore if the gas as it is measured at the works is at a higher temperature than that at which it is measured by the consumers' meters, there will be a discrepancy which we try to correct by calculation to 5° above the mean temperature of the air for the 24 hours. Then the consumers' meters are not exactly correct; there is a range of per cent. allowed by Parliament. A consumer's meter is stamped as correct if it registers not more than 3 per cent. against the Company and not more than 2 per cent. against the consumer; and there is a possibility of a certain amount of unaccounted-for gas. There is not much of it lost by leakage. In olden days it was a very common thing to see the ground turned over by gas men opening up a main as black as a hat. Now there is very little of that. The mains are laid better; and I think I may say a word for the system adopted by this Company. We lay most of our mains ourselves. We have them very carefully laid, and carefully tested for soundness when they are laid. I should like to say a word in praise of the officer, Mr. Richardson, our Surveyor of Mains, who has had charge of this work for forty years or more, in praise of the thoroughly good manner in which he and his men do the work. There is not much loss of gas from leakages in the mains, as I think I can prove. Some years ago, we supplied gas at the lowest possible pressure, under the idea that there was considerable leakage through the mains; but we have been obliged materially to increase the pressure—in fact, more than double it—throughout the twenty-four hours. Incandescent burners require higher pressures than ordinary burners; and then for gas cooking-stoves a higher pressure is required for the day-time. But though we have more than doubled the pressure in our gas-mains, this has not caused any increased loss—it has not caused any larger percentage of gas to be lost in this way. I think therefore that this conclusively proves that very little is lost through the mains, and that the unaccounted-for gas is due to differences in measurement, to differences in temperature, defective meters, and to some extent broken mains.

INCREASED EXPENDITURE AND DECREASED CONSUMPTION.

The next point I want to refer to is the question of the expenditure, We have saved money on a number of items; but a serious item is that of the distribution of gas. As I said, in 1889 it cost us rather under 2d. per 1000 cubic feet; now it costs us 4·94d. There is such an immense amount of work to be done in the district. One is canvassing for business; another is looking after our consumers. We have now about 325,000 consumers and more than that number of meters, and 23,559 public lamps—say at least 350,000 service pipes to keep in order. Then there is a vast number of incandescent mantles to be looked after; and here again is a reason why the consumption of gas does not increase. Our worthy Secretary told me this morning that in a large room in a friend's house they now have one inverted mantle burner where previously they had three upright incandescent burners. Now the three upright incandescent burners would burn about 10 feet of gas an hour, and the one inverted mantle burns about 3¼ feet per hour. The three burners consumed about three times as much. Many people are adopting the inverted burner, which is in fact the most beautiful and best light that can be got. But it is against the consumption of gas, and is the main cause of our reduction in gas sold of nearly 1¾ per cent. in the half year. In the December half it was nearly 1½ per cent. increase; but the present standstill of the business can be more than accounted for by the saving consumers have effected in the use of incandescent mantles. We advocated them. It is not for us to complain. We took the lead in endeavouring to obtain free trade in mantles; we have done all we can to induce consumers to adopt the incandescent mantle; and the result is that we have not had the continuous increases we hitherto had. We have, however, added to the number of our consumers 10,863, and 9887 gas-stoves. As the report says: "The greatly improved methods of using gas have reduced consumption, but at the same time have enormously increased efficiency. The result is two-fold—more light from less gas, and a strengthening of the position of gas companies." Well, if we sell the cheapest and the best light, I think we need not much fear any competition to which we may be exposed. There is little to be said about products. Tar, unfortunately, is not realizing anything like the price it ought to. We obtain per ton of coal from the sale of tar 1s. 1½d. The deficiency of £4000 compared with last year was mainly due to the great fall in the price of pitch. Pitch a few years ago reached 55s. per ton: and now it is realizing less than 20s. The demand for tar for road making is rapidly increasing, which will reduce the surplus in the market. In ammonia we have done better—there is a gain of about £5000. This is not because we have got better prices, but because we have succeeded in preventing the waste of ammonia. It is a very volatile thing; and if the process is not properly

managed, and if the tanks containing it are not properly sealed, a considerable portion of the ammonia evaporates. This £5000 is entirely due—not to the increased price, not to the increased quantity made (because there has been neither), but to the efficient working of our people. I may mention here that the Engineer in charge of our Bankside works was the first under Mr. Carpenter to carry out these improvements in saving ammonia. They have now been extended to other works; and the benefit is shown in the accounts. In mentioning Mr. Carpenter, I have to say I am exceedingly sorry that he is suffering from a bronchial attack. He wrote me a letter, which I got this morning; and I think I might read a word or two from it. He says: "I am sure if you have an opportunity you will express for me my firm belief that, despite the hard times, due to bad trade and other causes, through which we are passing, we are, thanks to co-partnership, in a strong position to carry on our business and meet its requirements." Then he says "You will know how keen is my disappointment that on one of the only two days of the year when I have the opportunity of facing the shareholders, I should be absent." I am sure you will all wish me to convey our warmest sympathy to him in his illness, and our hope that he will soon be better.

CO-PARTNERSHIP.

The third paragraph in the report relates to co-partnership. I need not say much about this, because it has been dealt with times out of number, and something is said about it in the report. But I should like to correct a mistake. I have heard the South Metropolitan described as a semi-philanthropic concern. Now there is nothing philanthropic about this co-partnership. We do believe it is the best and the just means of dealing with our employees; but at any rate "philanthropic" does not apply. The £36,426 bonus for twelve months is 7½ per cent. addition to the salaries and wages which we pay to our employees of all ranks; and if the co-partnership system is not a success, if it does not tend to produce efficiency, it will not continue, it will not last. Nothing in this world which does not answer its purpose continues permanently; and co-partnership certainly will not unless it tends to efficiency of working and to the general advantage of the shareholders, consumers, and employees. We are very anxious in the adoption of machinery to get the right and most perfect and most efficient machinery, and we are also very anxious to adopt the most efficient methods of working; but it is of much greater importance to get efficient service. That is more than anything else. If our 6000 employees render us devoted and efficient service, it must tend greatly to the advantage of the Company and to the advantage of everybody; and I put it to our employees—they read these reports and some of them are present here—that if they believe this co-partnership system is right, if they believe it is beneficial to them, its permanent success depends on their making the working of the Company as efficient as possible. The shareholders, I am bound to say, have always shown the most liberal spirit in the matter, and the utmost desire to deal fairly and considerately; and we think the result has been that we have such a body of employees, so attached to the Company, so devoted to its interests, that there is no fear of failure. As we say in the report: "Their pecuniary interest in the Company is now well over £350,000 in stock and on deposit, and, as was lately remarked by an inquirer, it is probable that there is no body of employees in existence with such a holding in the business in which they are engaged." Of course, there are much larger companies than this; and the passage ought to have read "it is probable there is no body of employees in existence of equal number, with such a proportionate holding in the business in which they are engaged." We believe that we are doing (of course, nothing could have been done without you shareholders) what is possible to effect a better distribution of wealth—to make our employees of all ranks owners of property, and to lift them in the social scale and make them better men. The Archbishop of Canterbury, when asked the other day whether the Church would not encourage friendly societies and other societies for the promotion of thrift, said that one of the objects of the Church was the building-up of character; and he used these remarkable words: "I know of nothing of the human sort more calculated to develop character than the encouragement and practice of thrift." We believe we are doing right; and I think you may be satisfied that in supporting us in this movement you are doing your part, and acting justly towards your employees. I may say that other companies are now coming in, and the principle is spreading. It was suggested a little while ago, by a member of the Government, that he hoped to see a Conciliation Board established for all the industries of the kingdom. As to the Conciliation Boards that are established, there is not much conciliation apparent; there is certainly none in the Railway Conciliation Board. But we have something better. Conciliation is one thing, and may be good when it is properly acted upon; but this system of ours anticipates and forestalls difficulties and troubles. The report states that the Directors are able to say that during the nineteen years of the existence of the co-partnership system "the Company has been absolutely free from anything in the shape of a difficulty or difference with its servants." We never could have conceived anything like it. Now, ladies and gentlemen, you have been very patient in listening to this statement of mine. I now close by moving the resolution, which the new Director (Mr. Bush) will second.

Mr. FRANK BUSH, in seconding the motion, said he would like to stop there, as Sir George had dealt with matters very exhaustively. But he was told that, as junior member of the Board, a few words from him were necessary; and therefore he must obey instructions. So long as he had known Sir George, and that was now a great many years, his watchword had been "Keep down your capital." Any company that kept down its capital invariably charged a low price for gas. Low capital and low price of gas went very well together in double harness. Seeing that the business was not extending at the present time, it became doubly necessary for them to keep down their capital. He knew that Mr. Carpenter and all those who had control of the spending of capital meant to keep it down to the lowest possible point. The economical methods of consumption referred to by Sir George must in the long run be of advantage to the Company.

REMARKS BY SHAREHOLDERS.

A SHAREHOLDER wished to know on what basis the Directors' fees were calculated. Did they depend upon the amount of capital, the quantity of gas sold, or the net profit? He also questioned the item of £9327 for general charges. There was no statement as to what these general charges were; and it seemed to be a large item. With regard to the leakage of gas, he did not understand why the figure of 43,924 was stated in "thousands."

The CHAIRMAN explained that the figure was really 43,924,000; but it had been stated in this way to do away with the three cyphers.

Sir FORTESCUE FLANNERY expressed the opinion that the broad points arising out of the report and balance-sheet, and the very comprehensive statement of the Chairman, were well worthy of the consideration of this well-attended meeting. "Sweet are the uses of adversity," at all events as applied to the South Metropolitan Company and its employees, because they had been passing, and were still passing, through a period of somewhat restricted prosperity as compared with the past. As the Chairman had said, the gas industry as a whole was supplying proportionately less gas. True, the consumers were increasing very much in numbers—the increase being something like 100 per cent. in the last ten years. But the quantity of gas supplied was not increasing in anything like the same ratio—only something like one-third; so that they were supplying less gas to a very much larger number of consumers. If this state of things—doing more business for comparatively less profit—should continue, it would have, he believed, the effect of consolidating the position of the gas lighting industry. He was very glad that the shareholders were going to get the full dividend the sliding-scale allowed; and he sincerely hoped that it would be possible, when things should be a little better, for the full dividend to be declared, instead of the shareholders receiving rather less, as had been the case for some past half years. He wished also to refer to the test which the co-partnership system had gone through. Their co-partners, the employees, were mostly the consumers of the gas which they helped to make. They had had a little more to pay for their gas; they had had a little less bonus; and they had had reduced profits as shareholders in the Company. Yet the Chairman had told them—he was sure without the least exaggeration—that their employees were absolutely contented, and as enthusiastic as ever they were in regard to the system of co-partnership. When this was first established, the croakers said: "It is all very well now; fire away. But what will happen when there is any drawback, any adversity?" They had now had sufficient indication of how this would be. Contentment still prevailed, and the employees were satisfied—more than satisfied—with the system; and he believed that if even greater drawbacks were to occur, co-partnership would still stand the test successfully. They were all very sorry for the absence of Mr. Carpenter, who, with their Chairman, was one of the forerunners—one of the pioneers—of the system; and he would re-echo the expression of the hope that he would soon be quite well again. In connection with the extension of co-partnership, he would like to mention that "The Times" that morning stated that the Tottenham Gas Company—one of the largest of the gas companies in the North of London—had just adopted the system; and he sincerely hoped that, as the South Metropolitan and South Suburban Companies had set the example, this reform would spread throughout the gas industry, as it might, he thought, be attended with consequences more far-reaching than were to-day anticipated.

A SHAREHOLDER called attention to the very large number of robberies from slot-meters, and to the increase during the last half year; and he asked whether it would not be possible to make the consumers co-partners, or whether any other method of paying for the gas could not be adopted. He would ask the Board to consider whether some mechanical means could not be adopted by which this great amount of robbery could be obviated. He had been a meter-maker and gas-fitter in his younger days, and regarded prevention as better than cure. It was their bounden duty to do their best to prevent these robberies. The cost of them to the Company in the half year was £1458.

The CHAIRMAN: No; only about £500. There were 6315 slot meters damaged, and the amount of money stolen is £586.

The SHAREHOLDER said he was taking into consideration the cost of repairing the meters, which he estimated would be at least 2s. for each meter, as there was the taking down, repairing, and replacing. He had no information as to the number of prosecutions there had been.

Another SHAREHOLDER said that, owing to his dividends being sent direct to his bankers, he did not receive the very interesting reports of the half-yearly meetings which were sent out.

The CHAIRMAN: We send the report with the dividend warrant to the bank. We will consider whether it can be managed that a separate report shall be sent to those shareholders whose dividends are sent to their bankers direct. As to the slot-meters, we put the figure into the report in order to draw attention to the matter. I am sorry I do not see any possibility of applying the co-partnership principle in that direction; and as to inventing something, many ingenious minds are at work upon it. Of the 6315 robberies from meters broken open, 5354 were in empty houses. Many consumers leave a house without giving us notice; and we suspect that a certain number of them, when they go away, break the meter open themselves, and take the money. Of the 5354 meters broken open in empty houses 2399 had no money in the boxes—the Company having cleared them. We put notices on these boxes that they had been cleared. But I suppose the thieves thought this was only a "blind;" and they have broken open 2400 boxes in which they found nothing at all. Lately the thing has become somewhat better. We got 93 convictions; and I can assure you the Directors are doing all they can in the matter. As to Sir Fortescue Flannery's remarks about the extension of the co-partnership system, the companies who have adopted it this year are the Walker and Wallsend, Leamington, Rugby, Wrexham, and Tottenham; and three or four others are about doing likewise. So it is growing. As to the "general charges," this item comprises everything that we cannot include under a specific head. I have a list of about twenty items here. One is for stamps, £1471; another is stamped transfers, £759; telephones, £176; and about twenty other things, including Christmas presents of tea and sugar to the men, £647. It does not include anything paid to the Directors, whose fees are stated apart. Parliament, with the approval of the Board of Trade, has authorized the Directors to share among themselves £5500 a year; but they have not taken this amount. They have been dividing only £4900 instead of £5500. In addition, there are the Employee Directors' fees.

The resolution for the adoption of the report was then put and unanimously adopted.

THE DIVIDEND.

The DEPUTY-CHAIRMAN (Mr. Robert Morton) proposed—"That a dividend at the rate of 5⅛ per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post."

Mr. HENRY AUSTIN, in seconding the motion, said he had had great pleasure in helping to earn the dividend of which he was about to receive a portion. With regard to co-partnership, he looked upon it as one of the best conditions under which a working man could labour. It assisted him to do without the legislators; and in the South Metropolitan Company they were creating old-age pensions for themselves without legislative aid. On the share register the workmen held stock on which they would receive in dividends this half year £5615. He wished to know if there was anything in this world that could make a workman more cheerful, or work more assiduously, than the figures he had read out. Elsewhere there were strikes and rumours of strikes. A sum of £51,000 had been spent in strike pay during the half year; and the loss in wages was estimated at a million.

The CHAIRMAN, in putting the resolution, said the Directors were paying the full dividend to which the shareholders were entitled.

The resolution was adopted.

VOTES OF THANKS.

The CHAIRMAN said he should like to move a vote of thanks to the officers and staff. This motion had usually come at the end; but it ought to come into the business of the meeting, as showing the relationship existing between the Company and their employees. It was a matter of importance that acknowledgment should be made; and he had great pleasure in proposing a vote of thanks to the officers—to Mr. Carpenter and those under him, and to Mr. M'Leod and those under him—for their devoted services during the half year.

The DEPUTY-CHAIRMAN seconded the motion, and it was carried unanimously.

The SECRETARY, replying in the absence of Mr. Carpenter, assured the meeting that the whole of the employees very highly appreciated this generous expression of thanks. They could not claim to have done more than their duty in any instance; but the knowledge that one had done this was sufficient to induce satisfaction. It was very grateful, encouraging, and stimulating to receive the commendations of those in whose interests they had worked so hard. He joined in the regret which had been expressed at the absence of Mr. Carpenter, and said that all his colleagues of every rank shared in the hope that he would soon be restored to his place.

Alderman HOWLETT thought they should not leave the room without passing a hearty vote of thanks to the Chairman and Directors for their conduct of the business of the Company during the previous six months. The report afforded very little ground for criticism. One must take the rough with the smooth; and he happened to have a little money in other things where the results had not been so satisfactory as they had been in this particular Company. With regard to what had been said as to the robberies from slot-meters, fortunately (or unfortunately), he happened to be the possessor of some small house property, and when his tenants left they very often took not only what was inside the slot-meter, but frequently the taps and pipes, and anything else that was portable; and his repairs cost him a good deal more than it cost the Company to repair the gas-meter. He had no doubt the Board were considering the matter. He was afraid we had not reached the period of our history when honesty would be in every man's heart. Much of the mischief was caused by boys, who were, however, sometimes of larger growth. A good deal had been said as to the decrease in the consumption of gas by reason of the alterations which had taken place in mantles; but he thought that if it had not been for the Welsbach burner, gas companies would have been in very much worse straits than they were to-day. This burner had taught people to burn gas instead of resorting to other illuminants. He believed that in the future, when things had levelled-down, the Company would again have an increased consumption of gas. He knew of many people who were giving up electric light in favour of gas, in consequence of the increased efficiency of the burners now in use; and gas was becoming a more popular illuminant than it had ever been in his lifetime.

Mr. HOOPER, in seconding the motion, observed that this was the first shareholders' meeting he had attended, and he had enjoyed it very much indeed. He had been assured that Sir George Livesey would be worth listening to.

The vote of thanks having been carried by acclamation,

The CHAIRMAN (who has served the Company for 60 years), in acknowledging it, said that to have so large a meeting in August was, he thought, unprecedented in company history; and he thanked those present for their vote, and for the kindness and heartiness with which they had supported the Directors.

The proceedings then closed.

Jubilee Meeting at Barnstaple.—Fifty years have elapsed since the Barnstaple Water Company was inaugurated; and Mr. C. E. R. Chanter, who presided at the one-hundredth half-yearly meeting last week, alluded to the fact that of the original shareholders the names of three were still on the books. He also mentioned that his father was the Chairman of the half-yearly meeting in 1859. The revenue of the Company was still increasing, and for the last half year was £1870, compared with £1836 in June, 1907. The Directors intended to convert one of the two original filter-beds into a settling-tank. By checking the waste the consumption had been reduced from 888,000 gallons per day in April, 1907, to 637,000 gallons per day, or from 68 gallons to 49 gallons per head; and they hoped to be able to reduce it to 30 gallons. There was no scarcity of water; but they wished to reduce the cost of filtration, which was very heavy. The accounts showed a balance of £3170 to the credit of the profit and loss account; and it was decided to pay the customary dividends of 10s. and 7s. on the two classes of shares, with 1s. additional on account of back-dividends.

COMMERCIAL GAS COMPANY.

The Ordinary Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. G. BRADSHAW in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice convening the meeting; and the Directors' report and the accounts (which were given in the "JOURNAL" last week) were taken as read.

DECREASE IN CONSUMPTION, AND THE CAUSES.

The CHAIRMAN, in submitting the report and accounts for adoption, said: The half year with which the report and accounts deal has been, as you all know, one of declining trade and diminishing prosperity all over the world. That our country has not escaped has been abundantly proved by the reports of the railway companies just issued and the Board of Trade returns of our foreign trade. Our own accounts also show that we have been affected by the general set-back. For the first time now for a good many years, we have to chronicle a decrease in the sales of gas amounting to 27 million cubic feet, which is nearly 1¾ per cent. upon the quantity sold in the corresponding half of last year. I think this decrease is to be attributed to three causes: First, in part, to the extended use of incandescent burners, which give a greater efficiency in burning gas, but at the same time consume less. So far, however, as that is the cause, we have no ground for regret. For years past, we have, in fact, done everything to foster the use of incandescent burners; and the more they are used, the more they demonstrate the superiority of gas over other forms of illuminant, and the more firmly they plant the basis of the business of the Company. In part, too, the falling off has to be attributed to the mild weather experienced at the beginning of the year, when we expect to make the greater proportion of the half-year's sales. To some extent—I am afraid to a very considerable extent—the falling off must also be attributed to slackness of trade in our district, and to the necessity which no doubt most of our constituents have felt of exercising a more than ordinary caution in their expenditure, so that they have found it essential to use as little gas as possible. You will remember that, this time last year, we raised the price of gas by 1d. per 1000 cubic feet. We have discussed this question many times with Mr. Stanley Jones, our Engineer, and have come to the conclusion that the increase in the price of gas has not affected the sales. At the same time we, on this side of the table, will be glad when circumstances admit of our lowering the price again.

PRICE OF COAL.

The chief cause that has adversely affected the accounts has been the cost of coal and oil. The price of coal has been higher than at any time during the last twenty years, excepting in 1900-1, in which year the price of coal f.o.b. in the North jumped up from 8s. or 8s. 2d. to 16s. We have made our new contracts for coal at a considerably lower price than last year, but still a good deal over the average of the last ten years. In looking through the commonplace book in which I keep my records of the Company, I notice that this year I complete twenty years as a Director of the Company; and it is therefore natural enough I should make some comparisons during that period. I find that the average price of coals for the first ten years, 1888-1898, was 7s. 4d. per ton f.o.b. in the North; and the average price for the second ten years, 1898-1908, was 9s. 9d. In other words, the average price for the second decade was about 2s. 6d. per ton more than for the first, which is equivalent, if you estimate that a ton of coal produces 10,000 cubic feet of gas, to 3d. per 1000 cubic feet. It reflects the greatest credit on gas engineers in general, and on our own engineering staff in particular, that they have been cheapening the manufacture of gas, so that in our case the average price has only risen by 1d., instead of 3d.

REASON FOR THE UNFAVOURABLE COMPARISON.

Now I ought here to point out that one reason why the half year does not compare favourably with the corresponding half year is that all the coal used was bought at the higher price. Our new contracts have not made themselves felt until the beginning of the current half year; so that we had the higher price last year for the whole of the coal carbonized up to June 30. This is rather unusual, and is due to the fact that we had a large stock. At the same time, the returns from residuals are disappointing. The prices have fallen off rather rapidly; and therefore, while our expenditure has been heavy, our receipts have not expanded in proportion. Nevertheless, there is no cause for more than passing regret, and no reason whatever for any discouragement.

PROGRESS OF GAS SALES.

It is many years since we have had a decrease in our sales; and if you look over a series of years, you will see the increase of the Company's business has been very satisfactory. Twenty years ago the Company were only selling 1859 million cubic feet of gas per annum. In five years (1893) this had risen to 1967 millions—an increase of nearly 6 per cent. In a further five years (1898), the consumption had advanced to 2401 millions, which was an increase of 434 millions in the five years, or no less than 22 per cent., due to the advent of coin-meters, and to the consequent extension of business to a poorer class of consumers. Five years later (1903), the consumption was 2818 millions—an increase of 417 millions, or 17·35 per cent. At the end of the next five years (1907), the consumption was 3188 millions—an addition of 370 millions, or 13·1 per cent. Altogether, in the nineteen years, our sales of gas have increased by no less than 1329 millions, which is equivalent to 71½ per cent. I think that is very satisfactory; and it bears out what I say, that there is no reason why we should be discouraged because we have a small decrease this half year. Moreover, we are not peculiar in this respect. Our neighbours the South Metropolitan Gas Company have had a decrease of exactly the same percentage; and the Gaslight and Coke Company have a decrease of nearly ½ per cent. You have always got to remember that the Commercial district is one of the poorest in London. It is surrounded by the districts of other Companies. It is fully built over; so that the only possibility of extension is by tapping the lower stratum of trade.

This we are doing, to the utmost of our ability, by fixing stoves and coin-meters as rapidly as we can.

SALIENT FEATURES OF THE ACCOUNTS.

Turning to the accounts, I will call your attention to the salient points in them. Coal and oil cost more by £12,435; but in manufacture and distribution we saved £2215. The only item of interest there is carbonizing wages. It was less by £1730. We always keep our eye on this figure, and are very glad indeed when it can be reduced, because it means good work and economical manufacture. Altogether, the extra cost of manufacture was £10,220 more than in the corresponding half of 1907. Then the receipts for gas were more by £3693; but you must remember that the price of gas was 2s. 6d. per 1000 cubic feet, against 2s. 5d. in the preceding half year. The rentals gave us more by £1372—due, of course, to the larger number of meters and stoves in use in the district. Residuals, I am sorry to say, returned us less by £1686. This is very disappointing. Breeze was less by £1061; tar, by £1494; sulphate, by £1307; but coke was higher by £2177. The result is that our receipts were increased by £3388, and our expenditure was more by £10,220. Therefore, our profit is less by £6832; being for this half year £54,974, and for the corresponding period of 1907 £61,806. Turning to the net revenue account, we brought forward £25,837. Adding to this the profit of £54,974, we have £80,812. Deducting the interest on the debenture stock and interest on the temporary loans (amounting to £8988), and stamp duty £509 (which I will presently explain), we have left a sum of £71,313 available for dividend. We recommend you to pay the same dividends as we have paid for a number of half years—viz., at the rate of £5 4s. per cent. on the 4 per cent. stock and 5 per cent. on the 3½ per cent. stock. This will absorb £52,825, so that we carry forward to the current half year a balance of undivided profits of £18,488. This is less than we brought forward; but the decrease is nothing more than we anticipated when the price of coal rose so much in April, 1907. You will remember that this time last year I warned you that the penny by which we proposed to increase the price of gas would not be sufficient to meet the increased expenditure, and that we should have to resort to the undivided profit. I explained at the same time that the undivided profit was there for the purpose of equalizing the dividend and the price of gas; and if we did not resort to it from time to time, there would be no justification at all for accumulating it in good times.

STAMP DUTY ON THE CONVERSION OF DEBENTURE STOCK.

As to the stamp duty. By our 1902 Act, we converted £300,000 of 4½ per cent. debenture stock into £450,000 of 3 per cent. debenture stock. This was a mere book entry. There was no issue of stock; but the Inland Revenue authorities claimed stamp duty upon it as though there had been a fresh issue. Naturally, the Board resisted the claim. A long correspondence and argument arose; and it was finally agreed to postpone decision until a similar case—*Attorney-General v. London and India Docks Company*—had been decided. The Docks Company had converted their debenture stock as we had done. The case was fought before the Court of First Instance, and went against the Company. It was carried to the Appeal Court; and the Appeal Court confirmed the decision of the Court below. It was then carried to the House of Lords; and the Lords, by their judgment, confirmed the decisions of the two previous Courts. It was no good fighting after that; and the only thing we could do was to draw a cheque for the duty, pay it, and feel as pleasant as we could.

CAPITAL ACCOUNT.

You will notice the capital account is overdrawn by £47,361. It is rather a large sum; and it foreshadows the issue of stock whenever the market is favourable for it. We have not yet taken the question of a new issue into consideration, or decided when the issue will be made.

TWO BILLS.

There are two Bills before Parliament affecting the gas industry to which I referred at the last meeting. One is the Port of London Bill, and the other the Mines (Eight Hours) Bill. We took part in a deputation to the Home Secretary with regard to the latter Bill; and we pointed out what a handicap the Bill would be on our industry and other industries if the price of coal were raised permanently, as we feared it would be, by the limitation of the hours of work of the miners. We vented a torrent of eloquence on the Home Secretary, but without the least effect; for the Government, as you know, have expressed their determination to carry the Bill into law. With regard to the Port of London Bill, that would affect us by reason of the probable imposition of a duty upon coal coming into the Port of London. We joined with the South Metropolitan, the South Suburban, and some other Companies for the purpose of lessening our expenses in opposing the Bill before the Hybrid Committee of the Houses of Lords and Commons who met jointly to consider it. We asked that coal should be exempt from duty altogether, on the ground that it was very important to the poor people of London, and was an article of universal use. But the Committee brushed that aside. We then asked that the River Lea should be put on the same footing as the Rivers Medway and Swale. There is a provision in the Bill that all goods passing through the Port of London into these two rivers should be exempt from duty; and we thought that our coals passing through the Port of London into the River Lea should also be exempt. But the Committee thought otherwise. They would not listen to the argument of Counsel; and they did not even hear the evidence we tendered.

THE IMMEDIATE FUTURE.

With regard to the current half year, our sales of gas do not show any marked improvement at the present time, nor do the prices of our residuals. But we have renewed our contracts for coal and oil at considerably lower prices; and we ought to have a saving there of some £9000 or £10,000. Therefore, I think, when we meet you in February next we shall probably be able to propose to you a dividend at the same rate as we recommend to-day. Between you and the diminution of the dividend, between the consumer and the increase of the price of gas, and between the profit-sharer and the decrease of bonus, there stands the sum of £18,500 as undivided profit.

The DEPUTY-CHAIRMAN (Mr. Walter Hunter) seconded the motion. He remarked that the reduction of the carbonizing wages seemed to be an important feature. It showed that the manufacturing staff were carrying on their duty excellently.

The motion was unanimously agreed to.

Moved by the CHAIRMAN and seconded by the DEPUTY-CHAIRMAN, dividends were declared at the rates of £5 4s. per cent. per annum upon the 4 per cent. stock of the Company, and of £5 per cent. per annum on the 3½ per cent. stock, both less income-tax.

Proposed by Mr. C. M'NAUGHT, and seconded by Mr. W. G. WILSHAW, a hearty vote of thanks was passed to the Chairman and Directors.

CO-PARTNERSHIP.

The CHAIRMAN, having acknowledged the compliment, moved a similar vote to the chief officers, their staffs, and the employees generally for the excellent work they had done during the past half year. He said he was glad to be able to bear his testimony that the work and conduct of the business had been uniformly good. The proprietors would also be glad to know that the profit-sharers had now an interest of nearly £39,000 in the Company, and that the profit-sharing scheme had, in the opinion of the Board, done all they hoped it would do in binding the men to the Company, and in accumulating the beginnings of small fortunes. It had been very gratifying to the Directors to notice, during the last few half years, how in the case sometimes of a breadwinner being suddenly snatched away from the family, the little amount of bonus had stood between want and the widow and children, and kept them until some other provision could be made for them; and in some other cases, in which sickness had come on families, the bonus had paid the doctor's bill and had brought comfort where otherwise there would have been destitution. Altogether he was very pleased with the profit-sharing scheme; and in the opinion of the Chief Engineer and all the officers of the Company, it had been a success. The Directors met the Profit-Sharing Committee (which consisted half of Directors and officers, and half of men) from time to time; and it was a great point to be able to meet representatives of the men, and get to understand their feelings. He was glad to see their attitude towards the Company was one of the heartiest goodwill.

The DEPUTY-CHAIRMAN seconded the motion, which was carried.

Both Mr. ELLIS and Mr. STANLEY JONES responded for themselves, their staffs, and the workers generally. Mr. Jones, among other points, remarked that the make of gas per ton of coal carbonized in the past half year had been the best on record.

WEST HAM GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Liverpool Street Hotel, E.C., last Thursday—Mr. J. L. GODLEE in the chair.

The SECRETARY (Mr. A. G. Snelgrove) having read the notice convening the meeting, the seal of the Company was affixed to the Register of Shareholders, and the report and accounts, referred to last week in the "JOURNAL" (p. 398), were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said he should like in the first place to refer to the resignation of the Vice-Chairman of the Board, Mr. Thomas S. Geere. At the last meeting, it became his duty to apologize for Mr. Geere's absence, owing to a serious accident which had occurred a few weeks previously. The Directors then hoped to see him again within a short time. But he did not make so rapid or satisfactory a recovery as was anticipated; and towards the end of the half year he felt obliged to resign his seat on the Board, of which he had been a member for eighteen years. He had always been keenly interested in the affairs of the Company; and the Directors would miss his help in many ways. They appointed as his successor his son, Mr. Thomas Henry Geere, who had long taken an active interest in the Company, was a large holder of stock, and possessed much of the knowledge of the district which his father had, and was always ready to place at their service. A year ago, he (Mr. Godlee) was, as he supposed many other chairmen of gas companies in the kingdom were, obliged to call attention to the increased price of coal; and, though they were then in the happy position of not at once feeling compelled to raise the price of gas, he pointed out that it was quite possible they might before long have to adopt the same course as many of their neighbours had done. Last February, he mentioned that the half-year's work had justified the course they had taken; and he indulged in the hope that coal prices might become easier in the spring. He also said that, without pledging himself as to the future, he very much hoped that the figure would continue unchanged for the present. The price of coal was easier, and they were able to secure a material reduction in their new contracts; but as to the charge for gas, he had not proved so good a prophet. As would be seen by the report, with a net profit for the half year considerably exceeding that shown this time last year, and with a large amount of undivided profit to carry over to the coming half year, they had given notice of a reduction of 1d. per 1000 cubic feet, beginning with the Michaelmas quarter. He was sure the proprietors would be gratified to find that the working of the Company had been so arranged as to make this possible. At the time of the last meeting, there was a decided falling off in the demand for slot-meter installations. But this proved only temporary; and they were continually increasing the number of consumers using these meters. They had now more than 36,000 slot installations in their district. The total number of such installations supplied by the Company since the beginning of 1903 exceeded 42,000. There was no doubt that these meters offered a temptation to thieves; and in the same period 648 meters had been broken open. The sum actually lost, apart from the cost of repairs, amounted to only £33 6s.; but in a considerable number of cases empty meters had been opened, and in others the money taken had been recovered by the collectors. This £33 6s. was taken from 243 meters, and was equal to about 2s. 9d. per meter. The new capital authorized a year ago had recently been raised; but the present position of the Company did not make it necessary for them to promote

a Bill for further powers in the next year's session of Parliament. This was satisfactory; and he thought it was probable they would be able to postpone any application for another two years. It would be seen from the accounts that coal and oil had cost £10,000 more than in the corresponding half of last year. At the same time, the prices obtained for residuals had given them about £5400 more, notwithstanding small reductions in tar and sulphate of ammonia. The carbonizing wages had been reduced from 2·67d. to 2·37d. per 1000 cubic feet of gas sold; and the total manufacturing charges from 7·64d. to 6·89d.—a reduction of ¾d. per 1000 cubic feet sold compared with last year; making the reduction in this figure in two years amount to 1·66d. This brought the manufacturing charges decidedly below the average of the Metropolitan and Suburban Gas Companies quoted in "Field's Analysis." Distribution charges showed a marked increase per 1000 cubic feet sold, and were high. These charges included the amounts written off for depreciation of meters, stoves, &c., both ordinary and automatic; and the cost per 1000 cubic feet must rise as the proportion of slot to ordinary meters went on increasing. The large reduction of about £3000 in rates and taxes was reverting to the normal state of things; the amount appearing in last year's accounts being, as he explained last year, caused by the payments of sums which had been in abeyance pending the settlement of a long-standing dispute with regard to rating which had been recently disposed of by agreement with the Local Authorities. With the continued increase of the business of the Company there was again a small reduction in the fixed capital, from 12s. 1d. to 12s. per 1000 cubic feet sold. There had been an increase of more than 4 per cent. in the quantity of gas sold; and the net profit had gone up from 7·89d. to 8·56d. per 1000 cubic feet sold. The amount required to pay the dividend and make the addition to the reserve worked out at 7·42d. The sales of gas from the beginning of January to date showed an increase of something like 6½ per cent. over last year; and the balance of undivided profits amounted to £24,405. In the face of these figures, the shareholders would be satisfied that the Board had taken a right course in deciding to reduce the price of gas by 1d. per 1000 cubic feet from Michaelmas next, bringing it down to 2s. 8d. Under the sliding-scale, such a reduction, while benefiting the purchasers, gave a smaller benefit to the shareholders; and the Board hoped to be able to pay an increased dividend next year. The lighting business was now carried on in the face of competition, of the amount and character of which they knew nothing years ago; but while they were able to reduce the price of the article they had to sell, and the skill of the inventor year by year placed in the hands of the users of it improved methods of employing it, they thought the prospects of the Company were very hopeful, though their greatest rival was a Municipal Department which, without any reserve fund to fall back upon, seemed satisfied to carry on the business at a loss of which the Company had to pay a share. The Company at present had 22,704 customers using ordinary meters, consuming, on an average, 24,200 cubic feet per customer in the half year; and 36,187 who used prepayment meters, and consumed, on an average, more than 7000 cubic feet per meter in that period. The increase in ordinary consumers over last year was about 440, and of slot-meter consumers 6107. In order to meet this growing business, there had been 1½ miles of new mains laid in the half year. The Company continued to have absolute confidence in those who had the active management of the business in all departments. He believed that the concern was in a thoroughly sound condition, and that everything would be in readiness to meet satisfactorily the demands of next winter.

The DEPUTY-CHAIRMAN (Mr. H. Cecil Pelly), in seconding the motion, said there could be but one opinion—that the past half year had been a most satisfactory one. A year ago, when many gas companies were increasing their prices owing to dear coal, the West Ham Company were able to go on without doing so; and they were now one of the first to announce a reduction. This ought to be very gratifying, both to the consumers and the shareholders.

Colonel STUART said he could not understand why it was necessary to borrow money from their bankers, seeing there was a large balance carried forward. He should like to have some explanation of the item "unaccounted-for gas, 34,763,000 cubic feet," considering that in the previous half year only half this quantity of gas was unaccounted for. This amounted to nearly 4 per cent. of the total make. Referring to the working expenses, he noticed that they amounted to 77½ per cent. of the total received, which he considered a very high proportion. In the case of some railways, the figure was 66½ or 67½ per cent.; and in the London and North-Western Railway it was 67 26 per cent. The reserve and the insurance funds together amounted to £24,000, which, in his opinion, was not enough; and he hoped that in future this would be strengthened. The South Metropolitan Company's funds stood at about £300,000.

The CHAIRMAN said, with regard to the interest paid to the bankers, he might point out that the new capital was paid up on the 30th of June, and the capital account at the time was overdrawn. As to the unaccounted-for gas, it stood at 3·81 per cent., which, in his opinion, was an extremely satisfactory figure. It looked different from last year, because the Auditors had given credit in respect of certain days' consumption by the slot-meters which made the amount appear larger for comparison purposes than it ought to have been. He was afraid he could not go into the details of working expenses as between gas and railway companies. Probably his best answer was that they remained in the position in which they were two years ago; and the Company were paying a satisfactory dividend. With regard to the reserve fund, they were adding £500 every half year to it. There was not much temptation to make the insurance fund larger than it was at present.

The motion was then put and carried unanimously.

The CHAIRMAN next moved that dividends at the rates of £5 and £5 2s. 6d. per cent. per annum be declared upon the preference and consolidated ordinary stocks of the Company for the six months to June 30; and that £528 13s. 4d. be added to the reserve fund.

Mr. F. NICHOLSON, in seconding the motion, said he thought that the proprietors might look forward with great confidence to the future of the Company.

The motion was carried.

Colonel STUART, in proposing a vote of thanks to the Chairman and Directors, said the questions he had asked had been answered in a very satisfactory manner, and the statement of the Chairman was, as usual, most clear. In his opinion, the Company were in a very satisfactory condition. In the vote he would include the officers, who had worked well in the interests of the shareholders.

Mr. WIGLEY seconded the motion; and it was carried.

The CHAIRMAN, on behalf of his co-Directors and the officers, thanked the proprietors for the vote. He said it was a great gratification to him to be able to present so satisfactory a report, and find that the shareholders appreciated the work done for them.

Mr. JOHN CLARK (the Engineer and General Manager) also returned thanks; and the proceedings closed.

SHEFFIELD UNITED GASLIGHT COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented by the Directors at the half-yearly general meeting of the Sheffield Gas Company on the 7th prox., they remind the proprietors that in the first paragraph of the report submitted twelve months ago they referred to the prosperous condition of trade in the city, and the gloomy and cold weather, as accounting for the large increase (9·33 per cent.) in the consumption of gas over the corresponding period of 1906. Unfortunately, there has been a complete reversal of the state of trade, which is now in a very depressed condition. But, notwithstanding this, and though the weather has not been what is considered favourable for the consumption of gas, the increase in the quantity sold is again entirely satisfactory—being 103,287,000 cubic feet, or 6·59 per cent., more than in the June half of 1907. This increase, the Directors state, indicates that gas maintains its popularity both for lighting and the many other purposes for which the low price at which it is now sold renders its application economical; the average price during the half year being only 1s. 2·9d. per 1000 cubic feet. Owing, however, to the largely increased cost of coal, and to the fact that from January to March the price of gas was 1d. per 1000 cubic feet less than in the corresponding period of last year (the reduction having dated from April 1, 1907), the profit on the half-year's working is not sufficient by £8755 to meet the amount required for the dividend. This sum will therefore be made up from the surpluses brought forward, and there will then be a balance of £86,795 to carry forward, after paying the dividend. This will amount altogether to £43,424 on the three classes of stock.

The accounts accompanying the report show that the half-year's sale of gas produced £102,774 and residuals £72,480; a total revenue of £185,499. The expenditure on the manufacture of gas amounted to £119,585 (coal costing £76,542 and repairs and maintenance of works and plant £21,897); on distribution, to £15,066; and on management, to £6086; rents, rates, and taxes came to £9216; and the total expenses were £151,249. The balance of £34,250 is carried to the net revenue account.

CROYDON GAS COMPANY.

Half-Yearly Report and Accounts.

In the report which the Directors will present at the half-yearly general meeting of the Croydon Gas Company next Friday, they state that the sales of gas in the six months ending the 30th of June exceeded those of the corresponding period of 1907 by 4·26 per cent. The number of consumers increased by 1175, that of stoves on hire by 1008, and 175 stoves were purchased by consumers. Having been able to make contracts for coal on somewhat more favourable terms, the Directors express their pleasure in announcing a reduction of 2d. per 1000 cubic feet in the price of gas, as from the end of the present quarter. The sulphate house referred to in the last report has been erected and equipped; No. 2 retort-house, forming part of the old section of the works, has been rebuilt, and is being fitted with coal and coke handling plant on modern lines; and the erection of an electrical power house, wherein current will be generated by gas-engines to operate this apparatus, has been commenced.

The accounts accompanying the report show that the total revenue was £122,388, of which £87,359 was derived from sales of gas, £8132 from the rental of meters and stoves, and £26,778 from the disposal of residuals. A sum of £62,362 was expended on manufacture, and £16,784 on distribution; rents, rates, and taxes came to £4382; management cost £3972; and the total expenses were £92,221. For the corresponding period of 1907, the receipts were £111,081, and the expenses £82,911. The balance carried to the profit and loss account is £30,167, compared with £28,170; and the amount available for distribution is £28,257, against £28,511. The Directors recommend the payment of dividends at the rates of 14½, 11½, 10, and 5 per cent. per annum, all less income-tax, on the various classes of stock. This will absorb £22,049, and leave a balance of £6208.

The statements relating to the working show that, under the supervision of Mr. J. W. Helps, the Engineer and General Manager, 40,886 tons of coal and 546,488 gallons of oil were used during the half year to manufacture 647,593,000 cubic feet of gas, of which 605,616,400 feet were sold and 614,071,300 feet accounted for. The estimated quantities of residuals produced were: Coke, 24,532 tons; breeze, 6396 tons; tar, 503,324 gallons; ammoniacal liquor, 1,060,254 gallons—the make of sulphate being 442 tons.

Municipal Gas Supply in Finland.—In his annual report, the British Consul for Finland states that the consumption of gas during the past year from the Helsingfors municipal gas-works shows an increase of 21 per cent. compared with the previous twelve months. In the first-named period, 3,424,270 cubic metres (about 121 million cubic feet) of coal gas, and 100,210 cubic metres (rather more than 3½ million cubic feet) of carburetted water gas were manufactured. The gross income amounted to £10,849; exceeding that of 1906 by £3131.

WANDSWORTH AND PUTNEY GAS COMPANY.

Half-Yearly Accounts.

The accounts to be submitted at the half-yearly general meeting of the Wandsworth and Putney Gas Company on the 25th inst. show that the revenue from the sale of gas in the six months ending the 30th of June was £53,774; the rental of meters, stoves, and fittings, and the maintenance of incandescent mantles, brought in £9239; the sale of residual products realized £20,844; and the total receipts were £84,226. The expenditure included £54,761 for the manufacture of gas (coal costing £28 694, oil, &c., £8720, and repairs and maintenance of works and plant £10,960), £10,668 for distribution, and £3142 for management; the total expenses being £72,581. The balance carried to net revenue account is £11,645; and the amount available for distribution is £18,640. The Directors therefore recommend dividends at the rates per cent. per annum of £8 and £6 10s. on the "A" and "B" consolidated stocks, and £5 12s. on the ordinary "C" stock. The statements in regard to the working show that 36,820 tons of coal and 427,503 gallons of oil were used in the manufacture of 562,292,000 cubic feet of gas, of which 527,880,000 cubic feet were sold, and 534,344,000 cubic feet accounted for. The estimated quantities of residuals produced were: Coke, 22,092 tons; breeze, 2337 tons; tar, 364,693 gallons; sulphate of ammonia, 343 tons.

BOURNEMOUTH GAS AND WATER COMPANY.

Half-Yearly Report and Accounts.

The report which will be presented at the half-yearly meeting of the Bournemouth Gas and Water Company on Friday opens with the gratifying statement that the results of the working of the six months ending June 30 were "satisfactory in every department." The final charge was made in respect of the old Poole works demolished; and a slight decrease in the contract price of coal has enabled the Directors to announce a reduction throughout the district, as from the 29th prox., of 3d. per 1000 cubic feet in the price of gas used for lighting purposes. It is proposed to submit to the proprietors a draft scheme inaugurating a system of co-partnership or profit-sharing among the officers and employees, by which it is hoped to "stimulate zeal and aid thrift among the servants of the Company."

The accounts accompanying the report show that the total revenue of the Company for the past half year was £86,735, and the expenditure £65,043; leaving a balance of £21,692 to go to the profit and loss account. The sum available for distribution is £27,296; and the Directors recommend the payment of dividends at the rates of 6, 7, and 14 per cent. per annum on the preference, "B" ordinary, and original shares respectively. These will amount to £16,663, and leave £10,633 to be carried forward. The statements relating to the working show that, under the supervision of Mr. Harold W. Woodall, the Engineer and General Manager, 20,743 tons of coal and 335,635 gallons of petroleum spirit were used in the production of 364,259,000 cubic feet of gas, of which 337,012,255 cubic feet were sold and 347,268,755 cubic feet accounted for. The estimated quantities of residuals produced were: Coke, 12,502 tons; breeze, 1499 tons; tar, 269,048 gallons; sulphate of ammonia, 177 tons.

TUNBRIDGE WELLS GAS COMPANY.

Public Lighting Question—Adoption of Co-Partnership.

The Eighty-Ninth Half-Yearly Meeting of the Tunbridge Wells Gas Company was held last Wednesday—Mr. W. H. DELVES presiding.

The CHAIRMAN explained that, though a balance-sheet was not presented at the half-yearly meeting, it was usual to make some statement as to the position of the Company. He was glad to say that the half-year's working had been more satisfactory than he had ventured to anticipate. There was a substantial increase in the quantity of gas sold; and though coal was 3s. 6d. per ton more, they had carbonized nearly 200 tons less, as it yielded more gas. They had also paid more for oil, but had used less. The gas made was about 500 cubic feet per ton in excess of that produced in the first half of 1907; showing that both the conditions of working and the quality of the coal were better. In the total cost of carbonizing materials there was an increase of £1680; and as the residuals had fetched a higher price—viz., £1263—the net extra cost of the raw material was only about £420, for which about 7½ million cubic feet more gas had been made, and they had 200 tons more coke. The manufacture of sulphate of ammonia also showed a higher return; and the only residual in which they had not done better was tar. The Germans had now got hold of the manufacture of the products from tar, and so there was a very poor sale. The prospects for the next half year were good. They had a reduction of 2s. 2d. per ton on their coal contract. For the interim dividends, he was glad to say that, owing to the increased sale of gas, they would not have to draw on their reserves, as he had feared they would have to do. Though it was a bold thing to reduce the price of gas 2d. per 1000 cubic feet when coal was going up, the result justified the act; and the sale of gas under every heading showed an increase, including—wonderful to relate—a small one for public lighting. This was now only 3 per cent. of their revenue, though it was 30 per cent. of the revenue of the electrical undertaking; and they could congratulate themselves that they were not dependent for 30 per cent. of their revenue on the rates. As there had been a good deal of discussion about the street lighting, the shareholders would expect some explanation from him of what the Directors had done. The Gas Company made an offer to the Electricity Committee to light the street-lamps at £3 4s. 4d. for a year's contract. The Committee would not enter into a year's contract, and asked if they could have the same terms for six months. Desiring to meet the Corporation in every way, the Directors conceded this, and, at the same time, asked to be allowed a further opportunity of tendering. They put in a tender at £2 15s. for three years; but the Electricity Committee preferred to pay themselves £3 19s. till the end of the current year and £3 3s. in future, and take 200 more lamps, in preference to allowing the Gas Company to light their existing number of lamps at £2 15s. each. They tried to justify this charge by representing 8s. 9d. per lamp as a sinking fund. But this 8s. 9d. was to go on for ten years; and as many of them would not then be paying rates, he feared they would not appreciate paying so much more for the street lighting than they need do. Besides this, he might point out that the existing charge of £3 19s. per lamp had gone on for thirteen years, in which period the Electricity Committee must have paid their sinking fund over and over again; yet they had made no reduction of the charge to the ratepayers, though the Gas Company had made repeated reductions. This was a specimen of what municipal trading meant; and he hoped the ratepayers liked it. As the Electricity Committee were going to take 200 gas-lamps, and charge 8s. per lamp more than the Gas Company were willing to accept, the Company, who would be left with outlying lamps which it was not convenient to the Committee to take over, were admittedly justified in increasing their price; and they were going to charge £3 12s. 6d. for the smaller number of lamps in 1909, as the Committee would not give them a longer contract than one year. He would now turn to a more pleasant subject. The Directors were introducing a profit-sharing—or, as he preferred to call it, co-partnership—scheme, in which all their employees would participate. At present every penny reduction in the price of gas meant £1180 to the consumers and £302 to the shareholders; so that consumers and shareholders were partners in the success of the Company. But there was a missing link—viz., their employees; and now they wanted to make them also partners by a bonus scheme, under which they would receive 1 per cent. bonus on the total of their wages, for every penny reduction in the price of gas under 3s. This, at the present price of gas (2s. 8d.), would mean commencing the scheme with a 4 per cent. bonus, which in five years, with 3 per cent. interest the Company would pay on the deposits credited to the employees, would enable each man to become a shareholder, and enjoy all the privileges of one. The scheme was not compulsory. The men could join it or not, or leave it if they pleased; but he believed it would be a very great benefit to them, and enable them to exercise that thrift which it was so easy to preach, but was difficult for the wage-earner to practise. In five years each man would have about £20 credited, which would purchase a moiety of stock; and the Directors' object was to make the men shareholders as quickly as possible. He believed the men would take a still greater interest in promoting the success of the Company. They did so already; and the present scheme was not introduced from any motive of dissatisfaction with the work now done, but with a desire to give all their employees a direct interest in the success of the Company. Sir George Livesey had told him privately that the scheme had worked very well in the South Metropolitan Gas Company, and the men had substantially benefited. Their wages and salaries amounted to £12,000 a year, and the bonus to be credited would be about £500 a year, and a further £120 for every penny taken off the price of gas; so that he hoped consumers, shareholders, and employees would all benefit from this co-partnership. In conclusion, the Chairman gave a number of details in regard to the working of the scheme, and added that the whole cost of management and accountancy would be borne by the Company.

Several shareholders congratulated the Directors on introducing the scheme, and expressed confidence that it would be a success; and the meeting closed with the declaration of the usual interim dividends and a vote of thanks to the Chairman.

Details of the Co-Partnership Scheme.

The following are the principal features of the co-partnership scheme:—

A bonus of 4 per cent. will be given, calculated on the salary or wages of those employees who join in the co-partnership scheme by signing an agreement. The bonus being fixed on a standard price of gas of 3s. per 1000 cubic feet, the present price of gas being 2s. 8d. allows of an immediate bonus of 4 per cent., which will be increased or decreased as the price of gas varies. The bonus must remain to the credit of the employee in the books of the Company for a period of five years, in order to enable a sum to accumulate that will purchase the minimum amount of stock—viz., £10 nominal—after which one-half of the further annual bonus, with interest, is withdrawable at any time. Interest at 3 per cent. will be given on all amounts standing to the credit of the employee at the end of each year. The employee may also add to his investment such amounts as he may pay to the Company from his savings. The whole of the bonus and interest standing to the credit of the employee will be paid on his leaving the service of the Company, or at his death to the next of kin.

The scheme will be managed by a Co-Partnership Committee, consisting of two Directors of the Company, two co-partners appointed by the Directors, one co-partner working in the retort-house, one in the yard or workshop, one in the office, and one in the outdoor department. There will be three Trustees (one Director, one officer, and one co-partner), to be appointed by the Committee of Management; and two Auditors (one elected by the co-partners and one by the Directors). The Committee will meet not less than twice each year. The Company's stock is to be acquired by the Trustees as opportunity occurs, and transferred to the co-partners as soon as they have a sufficient sum to purchase £10 or more of stock at the market price. Every employee will be supplied with a pass-book and rules, which will be compared and initialled by the Auditors each year. The Company will provide all books and other incidentals, and keep the accounts, together with a record of all the transactions, at their sole cost and charges.

Lighting in the Home.—Arrangements have been made for holding at Olympia, in October, the Ideal Home Exhibition, features of which will, we are informed, be the latest types of appliances for lighting, heating, and cooking by gas. The automatic production of acetylene, for use where coal gas is not available, will be demonstrated; and methods of lighting by petrol will be shown.

PORTSEA ISLAND GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices on Saturday—Alderman Sir JOHN BAKER, J.P., M.P., in the chair.

The Directors in their report stated that the quantity of gas (636,676,500 cubic feet) sold in the past six months was appreciably in excess of that supplied in the corresponding period of last year—viz., 614,897,400 cubic feet. Under both prepayment and ordinary systems, the number of consumers had increased; and an additional number of cooking and heating stoves had been fixed. In the accounts accompanying the report, the revenue was £112,885, or an increase from £108,023 before; but the expenditure had risen to £96,569 from £88,875. The balance carried to the profit and loss account was £16,316, compared with £19,148 this time last year. Exclusive of the amount standing to the credit of the extraordinary renewals account (£7738), there was an available balance of £41,374, from which dividends were recommended at the rates per annum of 13 per cent. on the "A" and "B" shares, 12 per cent. on the "C" shares, 10 per cent. on the "D" and "E" shares, and 5 per cent. on the stock, less income-tax. After paying these there would be left a balance of £23,442 to be carried forward. The quantity of gas manufactured in the half year was 673,531,000 cubic feet, compared with 649,940,000 cubic feet in the corresponding period of 1907; and 56,055 tons of coal and 425,196 gallons of oil were used in its production.

The CHAIRMAN briefly proposed the adoption of the report. He commented on the continued increase in the manufacture of the commodity supplied by the Company, though they were side by side with the electric light. He affirmed also that the undertaking was on as permanent and firm a basis as they could desire.

The DEPUTY-CHAIRMAN (Mr. R. E. Hellyer) seconded the motion.

A discussion ensued upon the quiet policy which was being pursued by the Directors in face of the competition of electric lighting by the Corporation, who had sacrificed £750 per annum in abolishing meter-rents; upon the necessity of having at the head of private companies gentlemen who were not allied to Municipalism; upon the desirability of making a sacrifice to abolish gas-meter rentals, and of lowering the price of gas all round—the figures now standing at 2s. 4d. per 1000 cubic feet to ordinary consumers (as against 1s. 11d. at Plymouth) and 3s. 4d. to those who were supplied under the slot system. It was thought the report was not of the progressive nature marked out by the Chairman, inasmuch as the expenditure was £4000 above the increase in revenue, while there was a decrease of £3000 in the sum carried to reserve.

The CHAIRMAN justified his position by pointing out that the increased expenditure was mainly due to the rise in the price of coal, and that it was beyond the power of the Directors to sacrifice £5000 a year to provide free meters.

The motion was then put and carried, and the dividends recommended were declared.

A vote of thanks was accorded to the Directors, the Engineer and General Manager (Mr. J. D. Ashworth), the Secretary (Mr. H. A. Stibbs), and the staff.

TOTTENHAM GAS COMPANY AND THEIR EMPLOYEES.

The Co-Partnership Scheme.

At a Meeting of the Employees of the Tottenham and Edmonton Gas Company, held at the Edmonton Town Hall last Tuesday evening, Mr. CORBET WOODALL, the Chairman of the Company, explained the new profit-sharing scheme which, as intimated at the annual meeting of the Company on the 8th inst. (*ante*, p. 399), the Directors have decided to introduce. The other Directors present were Messrs. H. Bailey, J. Cloudsley, and J. Randall. The hall was well filled—some 600 of the officers and workmen being present.

The CHAIRMAN, in opening the proceedings, expressed the pleasure it gave him to meet so many fellow-workers of the Company, some of whom he had known for more than twenty years, and one or two for a much longer period. They were met, he said, to consider a scheme for equitably apportioning the profits earned by the Company between, first of all, the shareholders, secondly the workmen, and thirdly the consumers. The arrangement at present in operation between the shareholders and consumers worked perfectly well; and the Directors now proposed to bring in as co-partners the general body of employees. The Company were allowed to charge for gas a price which ensured a fair return to all concerned. As this was reduced, the dividend could be increased; and it was this principle which the Directors proposed to apply to the remuneration of the employees. They had no thought of interfering with the present wages system. Officers and workmen would receive their increases as in the past; but beyond the regular wages there would be divided among them a sum which would vary with the prosperity of the Company. Proceeding to enter into details, the Chairman explained that, in order to arrange a sliding-scale, it was necessary to take, as a starting-point, some figure as a standard price of gas. This would be 3s. per 1000 cubic feet; and the bonus would be ¾ per cent. on the annual wages earned by an employee for every penny at which the Company were able to sell gas at less than 3s. The price was at present 2s. 6d.; so that while this lasted the annual bonus would be 4½ per cent., or £4 10s. on each £100, on the annual money earned. Every man would thus be able to feel that, by excellence in his own work, by care for the property of the Company, and by generally doing everything in his power to further the interests of the undertaking, he was assisting to render possible reductions in the price of gas, by which, as a co-partner, he would benefit. (Loud applause.) In order to give every employee a substantial amount as a start, the Directors would set aside a sum to provide a bonus under the scale for three years, or for such less time as any person might have been in the Company's service. The whole of the first bonus would remain in the hands of Trustees, by whom it would be invested, as far as possible, in the Company's stock in the employees' names. Of future bonuses, one-half would be withdrawable if desired, or it might be left with the Company at 4 per cent. interest. Other sums could be added, as in the savings bank hitherto in operation, which would be superseded by the new arrangement. Co-partnership was freely offered to all regular and permanent employees; and the renewal of their agreements and their continuance in the co-partnership would depend upon their work and conduct. The objects of the scheme were to attach the employees to the Company's interests, and to encourage among them the spirit of thrift; and the Directors would feel that it failed in its purpose if any considerable proportion of the employees were to take out regularly the withdrawable half of the bonus, or sell the stock which might be transferred to them. They therefore reserved the right to put an end to the scheme if this were the case. They were confident, however, that the system would not fail, and that it would be a lasting benefit both to the Company and to the men. At the shareholders' meeting the previous Saturday, several questions were asked, one of which was as to where the money was to come from. He hoped the answer to the question would be given in future accounts, which would show improved profits. Another question was whether the employees had made any request for this change, or had expressed dissatisfaction with the present state of things. It was a pleasure for him to reply "No." The Directors had not for years past heard a whisper of dissatisfaction with regard to the terms and conditions of service of the employees. The Directors did not bring forward these new proposals with the desire to press men unduly at their work. Their purpose was to continue, and if possible strengthen, the present happy condition of things. (Loud applause.)

Mr. A. E. BROADBERRY, the Company's Engineer and Manager, as a co-worker, proposed—"That this meeting cordially accepts the liberal terms generously given by the Directors, thanks them for their kindness in promoting the welfare of all those in the Company's service, and pledges itself to do all in its power to make the new scheme a thorough success." He spoke of the splendid offer of the Company, and testified to the great interest which the Chairman, who had been well supported by the other Directors, had taken in the scheme. The employees would now, he said, have a union of heart and hand; and much as the Company had flourished in the past, they would carry on the work in such a way that it would flourish still more in the future.

Mr. DEAN, one of the foremen, in seconding the motion, said he was sure they would all do everything they could to repay the shareholders.

Questions in regard to the scheme having been invited, one was asked as to whether, if an employee died, his friends would receive anything due to the deceased.

The CHAIRMAN replied that, in the event of the death of a co-partner, the amount of his share, whether invested or not invested, together with the interest upon it, would be paid to his representatives, just as it would be paid if a man were leaving (with the good-will of his employers) to go to another situation. The Chairman added that the total annual bonus at the present charge for gas would be £2100 a year. The bonus to be divided for the last three years would be something like £4100.

The motion was cordially adopted.

The CHAIRMAN said he should like to say how much his heart was in this scheme, how cordially he wished it success, and how sincerely he pledged himself and his colleagues to do everything they could to carry it out in such a way that the future of the employees might be materially improved.

Mr. E. TOPLEY, the Secretary of the Company, proposed a vote of thanks to the Chairman, and said he joined in the scheme most heartily, and knew that all the members of the clerical staff would do their utmost to make it a success.

The proposition was carried unanimously.

Cheers for "Co-partnership" were called for, and for the Chairman; and they were most enthusiastically given.

The CHAIRMAN, in acknowledging the vote of thanks, said that he had been rarely more pleased than he was that night. He desired to associate his colleagues with what had been done. This had not been the work of one man, but they had been all and equally cordial in the scheme.

The proceedings then terminated.

DONCASTER CORPORATION GAS SUPPLY.

Reduction in Price.

At the Quarterly Meeting of the Doncaster Corporation last Wednesday, a resolution passed by the Gas Committee, and subsequently by the Council in Committee, to reduce the price of gas 2d. per 1000 cubic feet as from the 1st of October, gave rise to some discussion when it came up for confirmation.

Mr. Robinson moved an amendment in opposition to the proposal. He said it was doubtless very desirable, in the interests of the consumers, that the price of gas should be low; but he hardly thought the present time opportune for a reduction. The Corporation were committed to an expenditure of £147,000 within the next few years; and to reduce the assets even by a small amount was, to his mind, not a wise policy. They had received a letter that morning from the Dalton Main Colliery Company, giving them notice that they were going to commence working coal round, near to, and underneath the Blybergh reservoir. What this meant, he was not prepared to say; but he had put down a very modest sum—£15,000—for it. This made their expenditure £162,000. He argued that it was not a proper time to cut down their assets.

Mr. Theobald, in seconding the amendment, said the small reduction proposed was equivalent to a 2½d. rate, and would mean a loss of £1600 a year to the borough. In one private house in the town, where last year 11,500 cubic feet of gas were consumed, the reduction would mean a saving of 1s. 10d. to them, whereas if an additional rate of 2½d. in the

pound were charged, they would have to pay 6s. 3d. extra on their rates. The reduction would mean a loss to individual ratepayers. This would not apply to consumers outside the borough; and it was making a nice present to their neighbours. They had no right to burden the ratepayers to relieve the gas consumers of the small sum of 2d. per 1000 cubic feet in the price of their gas. He did not like to criticize the Gas Committee. He gave them credit for a well-managed undertaking; but let them not "kill the goose which laid the golden eggs."

Alderman Armitage, the Chairman of the Gas Committee, spoke at some length in defence of the recommendation, which he considered a very moderate one. He said that the Gas Department was now in a position to turn out gas second to none in the kingdom, and it was time that those who had provided the money and done so well for the borough should have some consideration. He had always been in favour of reducing the charge for gas, which had been rather above the market price. The gas-works had cost them about £120,000; but at present their indebtedness upon this large outlay was not more than £16,000. The gas consumers had paid off £104,000; and they should have some claim to consideration. Having given some figures as to the price charged for gas in other towns, Alderman Armitage pointed out that last year the Gas Committee contributed £5000 to the borough fund and paid £709 in interest and £458 to the sinking fund, and the average amount spent on new works and mains for the last three years was £2569. The loss of £1600 anticipated by Mr. Theobald would not occur if their trade increased. In the year 1906-7, when the price of gas was reduced by 2d. per 1000 cubic feet, the actual drop in the gross profit was only £584. During the past few years, the Gas Committee had allowed a bank balance to accumulate, and they could draw upon it if necessary, still afford the reduction of 2d. to the consumer, and increase the contribution to the borough fund. They would be able to meet some of the liabilities about which the mover and seconder of the amendment were so fearful. The main body of the consumers were not outside but inside the borough; 72 per cent. of all the gas supplied being used inside. Some members of the Committee, including himself, were in favour of a reduction of 4d. They thought, however, they would get unanimity in the Council if they recommended 2d.; and he hoped their reasonable recommendation would be supported.

Mr. Clark supported the resolution. He said the contribution of £5000 to the borough fund did not show the full amount of successful trading at the gas-works, as a great deal of capital expenditure had been met out of income. The gas consumer, by adding to the capital value of the gas-works, was adding an important asset to the borough. He mentioned, in conclusion, that a large consumer had recently put down gas-producing plant of his own, and said they did not want many of these in the town, as they would reduce the consumption of the Corporation's gas.

Messrs. Kay and Spencer also spoke in support of the resolution. Alderman Dawson made some comparisons between "healthy electricity" and the "nasty stinking atmosphere" of gas, and said that, as a gas consumer living out of the town, he was going to participate in a reduction he did not desire, as he was getting "good value for his money." The Mayor (Alderman J. F. Clark) agreed with the mover of the amendment that the present time was inopportune to throw or give away £1600 a year, especially as gas was not charged for at an exorbitant price. They ought to have a larger sale in a town that was increasing in size as Doncaster was. He did not think it would be a wise policy to reduce the price of gas any further at present.

On a vote being taken, the amendment was lost by 12 votes to 7; and the resolution of the Council in Committee was confirmed.

AN EIGHT-HOURS DAY AND COAL PRICES.

Speaking at the annual meeting of Messrs. Henry Briggs, Son, and Co., of the Whitwood Collieries, last Wednesday, the Chairman (Mr. W. G. Jackson) alluded in somewhat pessimistic terms to the probable effects of the passing of the Coal Mines (Eight-Hours) Bill. During the past year, he said, the Company's output had been about 36,000 tons more than the previous year. Prices had also been good, and there had been no difficulty in selling coal. The result of these favourable conditions was that they were able to slightly increase the dividend, and also to put aside £20,000 to a reserve fund. He was sorry they could not look forward to a continuance of these conditions in the current year. Trade was falling off in a most deplorable degree. The collieries were working short time; and they had before them the prospect of a considerable increase in their working costs. Last, but not least, they had the prospect of the Eight-Hours Bill. The precise effect of this measure would depend to some extent on the state of trade; but, at any rate, it was quite certain that it would mean an increase in the working costs and a decrease in the output of coal. If the decrease in output was generally so great that the demand overtook the supply, prices would go up, and possibly this might, for the moment, be for the benefit of the collieries. But it would be at the expense of the general trade of the country, which in a little time would be so crippled that a reaction would set in, prices would come down, and the last state would be very much worse than the first. At any rate, it was quite certain that if they had an Eight-Hours Act the result would be, when things had settled down, that there would be an increase in the price of coal. As far as they could, they were endeavouring to minimize the effects of any shortening of hours they might be called upon to carry out by placing £20,000 to the reserve fund.

Blackpool Gas Supply.—The accounts of the Blackpool Corporation for the year ended the 31st of March show that the income from gas, residuals, &c., amounted to £90,342; and the expenditure to £63,386—leaving a balance of £26,956, against £28,379 for the previous year. A sum of £13,640 was allocated to the relief of the rates. In the twelve months, 531,168,000 cubic feet of gas were made—an increase of 3·56 per cent.; and there were consumed within the borough 510,639,000 cubic feet, and outside the borough 8,591,200 cubic feet, or 27·21 per cent. more than in the year 1906-7. There are at present 13,623 consumers.

METROPOLITAN WATER BOARD.

Fifth Annual Report.

The Fifth Annual Report of the Metropolitan Water Board—for the twelve months ending the 31st of March—was issued last Tuesday by the Clerk (Mr. A. B. Pilling). It shows that the total capital debt of the Board on the 1st of April last was £47,392,664, divided as follows: "A" stock, £6,060,165; "B" stock, £34,100,361; redeemable debenture stocks, mortgages, &c. (including 1500 London Bridge annuities), £7,232,138. The annual interest charge is £1,425,977, divided as follows: "A" stock, £181,805; "B" stock, £1,023,011; redeemable debenture stock, &c., £221,161. The annual interest charge is equivalent to 4·3d. per 1000 gallons of water supplied. Of the total quantity of water obtained, 56 per cent. was taken from the Thames, compared with 57·3 per cent. in the year 1906-7. The remainder was obtained from the Lea, gravel beds adjoining the main stream of the Thames and at Hanworth, natural springs, and wells sunk in the chalk or other strata in the Lea Valley, in Kent, and at certain other points south of the Thames. The total quantity of water supplied during the year was 80,170·9 million gallons, or 357·9 million tons; the average daily supply being 219 million gallons. The southern district took the largest proportion, 28·258 per cent.; and the Kent district the smallest, 8·964 per cent. The total estimated population supplied by the Board at the close of the last financial year—viz., 6,976,795—represents 15·7 per cent. of the population of Great Britain and Ireland. There was a decreased supply of 1·29 gallons per head per day as compared with the preceding year; while the population is estimated to have increased 1·20 per cent., and the services 1·38 per cent. For the whole area, the average daily supply per head was 31·55 gallons. In 1906-7, the average daily supply per head was 32·84 gallons; in 1905-6, 32·31 gallons; and in 1904-5, 33·54 gallons. The percentage of supplies on the constant system throughout the Board's area at the end of the financial year was 97·4, compared with 96·24 for the preceding twelve months. The 30 storage reservoirs in the Thames Valley have a capacity of 6345·5 million gallons; and the 17 in the Lea Valley, 2499·2 million gallons—together, 8844·7 million gallons. This is exclusive of the Hampstead and Highgate ponds, the Camden Park Road reservoir for pond water, and the disused reservoirs at Cheshunt. No additions were made during the year. The Board have in immediate contemplation the construction of reservoirs of 4000 million gallons capacity in the Thames and Lea Valleys; and they have parliamentary authority for 2000 million gallons more—bringing up the total to 14,844·7 millions. There are 161 filter-beds, having a total area of 161·91 acres, or 0·87 acre per million gallons average daily supply of filtered water. The monthly average rate of filtration per square foot per hour during the year varied from 0·85 gallon in the Grand Junction division to 2·57 gallons through the New River beds. The total number of service reservoirs is 78, of 243·142 million gallons total capacity; and only two, having a capacity of 53 million gallons, are uncovered.

LIVERPOOL CORPORATION WATER SUPPLY.

Water Clauses of the General Powers Act.

At the Meeting of the Water Committee of the Liverpool Corporation last Tuesday, the Chairman (Alderman Burgess) made the following statement with reference to the General Powers Bill of the Corporation, which has received the Royal Assent.

Since the last meeting of the Committee, the General Powers Bill promoted in Parliament by the Corporation has received the Royal Assent; and as its most controversial clauses related to matters for which the Water Committee are responsible, it is, I think, right that I should say a word or two to-day regarding it.

The proposals made by us were threefold. We asked that a time-limit should be placed on our obligation to supply the boroughs of Warrington, St. Helens, and Widnes with an aggregate quantity of water amounting to six million gallons a day, which was imposed on the Corporation in 1880 without any corresponding obligation on these towns to take any water at all from us. As none of these places has ever asked for a single gallon of water from Liverpool, but has increased the quantity taken from other sources, we thought it right to ask to be relieved from a perpetual obligation which at some future time will undoubtedly press hard upon Liverpool. I think we did right to call the attention of Parliament to the matter; and I do not complain of the decision that the obligation should remain upon us for the present, as, in view of the fact that our second line of pipes has now been laid, we are not likely to suffer any considerable inconvenience for many years to come. But we have, I think, made it easier for our successors to obtain a more equitable arrangement for Liverpool whenever a largely increased expenditure is needed to cope with the needs of our compulsory area of supply.

The decision of Parliament upon this question is an interesting commentary on the unfortunate and mistaken decision of the City Council, which refused to ratify the excellent arrangement made with Birkenhead by the Committee—a decision which unnecessarily involves the neighbouring borough in an expenditure of probably a million sterling, and which, I fear, will render still more difficult that unification of the port which is, I am more convinced than ever I was, greatly to be desired in the interests of the prosperity and commerce of the Mersey. It is evidently the view of Parliament that large gravitation supplies of water should be used, not selfishly, but with due regard to the needs of all those localities which can naturally be effectively supplied by them; and there can be little doubt that the view expressed, if I remember rightly, by His Majesty the King many years ago, that water supply is a question not only of local but of national importance, will gain ground.

With reference to the other two water clauses of the Bill, we succeeded to the full extent of our expectations. The wording of a clause in the Liverpool Corporation Act of 1866 deprived us of the protection of a clause in our Act of 1862, under which we were obliged to give

such a supply as could be furnished by gravitation from our works. A previous attempt to remedy this mistake had been unsuccessfully made, and we had a very uphill battle to fight this year in consequence. I feel that we may congratulate ourselves on our success in convincing Parliament that we were entitled to ask for a limitation of our liability, and upon having obtained a clause under which we are in no case liable to give any supply to a greater height than 35 feet from the ground level, unless such supply can now be afforded by gravitation. This decision enables our engineers to gauge accurately what they have to provide for, and, in my judgment, is fair and equitable, especially having regard to the fact that, unless some obligation to supply at a given height had been fixed, a considerable acreage in some parts of our area might have been excluded from the possibility of building operations.

But our most notable success was achieved on the question of water charges in the areas outside the city which are within our compulsory district of water supply. On two previous occasions, the Corporation had unsuccessfully endeavoured to have the obvious injustice of these charges remedied. Hitherto the citizens of Liverpool, in addition to the water-rent, have paid a water-rate of 6d. in the pound; while the utmost charge for domestic water supply in the outside districts has been 3d. in the pound more than the rent in the city. For example, at this moment Liverpool pays a water-rent of 7½d. and a rate of 6d.—altogether 1s. 1½d.—while the outside districts pay a water-rent of 10½d. We stated plainly that though, since the whole responsibility of the undertaking rested upon Liverpool, we should be justified in expecting the outside districts to pay more than the city, we asked for nothing more than equality of charges. I believe our moderation greatly influenced the House of Commons Committee; and I am glad to be able to say that under the Bill of this year the charge for domestic water supply outside the city will be a water-rent of 6d. in the pound more than in Liverpool—the additional water-rent outside being thus made the same as the water-rate here. Thus, the rate and rent in the city would now be 1s. 1½d., and the domestic water-rent outside the city would also be 1s. 1½d. We have, therefore, succeeded in removing a hardship under which for 46 years Liverpool citizens have suffered; and the water revenue will receive some thousands a year more from those who get Liverpool water but do not live in the city.

CARDIFF CORPORATION WATER SUPPLY.

Proposed Additional Storage.

A Special Meeting of the Cardiff City Council was held last Thursday to consider the suggested construction of a reservoir at Taff Fawr. The question had been discussed to some extent at a previous meeting, and adjourned. The Water Committee in June passed a resolution to the effect that an increased water supply for the city was one of extreme urgency, and recommended that the Council should without delay authorize the construction of the reservoir, that a Bill should be promoted for acquiring the necessary lands, and that sanction should be sought to borrow the requisite money.

The Chairman of the Committee (Alderman Robert Hughes), in moving the adoption of the resolutions, quoted extensively from the reports presented by the late Mr. J. F. Bateman (the expert called in during the early part of 1882), Mr. J. A. B. Williams, M.Inst.C.E., and Mr. C. H. Priestley, the Corporation Water Engineer, to show that the proposed new reservoir was absolutely necessary to the future needs of the city. He pointed out that the suggested scheme was accepted by the Corporation many years ago; the only difference now being with regard to the acquisition of 50 to 55 acres of additional land for the reservoir. It had been suggested that they should raise the banks of the present reservoirs. But, without going to Parliament, they could only raise those of the Cantreff reservoir; and even if they did this they would still be very far short of the storage they would require. They wanted to make provision for 900 million gallons of water. They were absolutely dependent upon the rainfall, as they had no springs on which to rely. In every July for the last nine years, with the exception of last July, they had had no rain; and therefore they had to prepare for a possible drought in future. Their receipts from water for trade purposes had gone up nearly £10,000 a year during the last ten years; and they now had a demand for 2 million gallons a day, which they could not give. As to the cost of the new reservoir, the estimate in the joint report was £235,000; and even if the actual cost was £250,000, the reservoir would take eight years to complete. If 50 years were allowed for repayment of the larger sum, this would mean £11,125 per annum, or rather less than a 2⅜d. rate.

Alderman Morgan advocated the appointment of an independent person to report on the subject, and the laying out of about £11,000 on the present reservoirs to increase their capacity, before undertaking the large expenditure proposed. He said Mr. Priestley had considerably over-estimated the increase in population; while the consumption of 28 gallons per head per day was extravagant, and ought to be reduced. The cost of carrying out the big scheme would be 4d. or 5d. in the pound for many years.

Alderman Trounce urged that the Council should have an opportunity of considering an alternative scheme before committing themselves to the vast expenditure suggested. Having read extracts from Mr. Williams's report, he said that at a cost of £11,250 the present reservoirs could be increased to provide additional storage capacity to the extent of 75 million gallons. He urged the restriction of the use of the Taff Fawr water to domestic and household purposes, and said it was a shame that they did not provide less expensive water for trade. The Great Western Railway Company were throwing into the Severn 17 million gallons of water per day, and this might supply both Newport and Cardiff for trade uses.

Alderman Hughes said Mr. Priestley informed him that the water being put into the Severn by the Railway Company was infinitely harder even than the Ely water, and that no one would take it for trade purposes.

Mr. Priestley stated that the water referred to was quite unsuitable for trade purposes; but he believed it would be possible to soften it—at a cost. However, it was hardly likely to be suitable for Cardiff, when Newport, after going to considerable expense in obtaining analysis, &c., declined to take it. Even if it were, it would cost £50,000 to £100,000 to bring the water from the tunnel to Cardiff, where it would have to be stored—thus adding greatly to the cost.

After further discussion, an amendment was adopted, requesting the Water Committee to consider and report on the various suggestions made for providing an additional water supply for the borough.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 439.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 10	10	Alliance & Dublin 10 p.c.	19—20	..	5 0 0
268,324	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
310,000	Stk.	July 15	4	Do. 4 p.c. Deb.	99—102	..	3 18 5
200,000	5	May 29	6½	Bombay, Ltd.	6—6½	..	5 0 0
40,000	5	,,	6½	Do. New, £4 paid	4¼—4⅝	..	5 9 6
50,000	10	Feb. 27	14	Bourne-mouth Gas and Water (10 p.c. B 7 p.c. Pref. 6 p.c.)	28½—29½	..	4 14 11
51,810	10	,,	7		16½—16¾	..	4 3 7
53,200	10	,,	6		15—16	+⅛	3 15 0
380,000	Stk.	Aug. 13	12½	Brentford Consolidated	238—243*	+1½	5 2 11
300,000	,,	,,	9½	Do. New	178—183*	+¾	5 3 10
50,000	,,	,,	5	Do. 5 p.c. Pref.	117—122*	—½	4 2 0
206,250	,,	June 12	4	Do. 4 p.c. Deb.	100—105	..	3 16 2
220,000	Stk.	Mch. 12	11½	Brighton & Hove Orig.	210—215	..	5 4 8
246,320	,,	,,	8½	Do. A. Ord. Stk.	154—159	..	5 3 9
460,000	20	Mch. 27	10	British	41—43	..	4 13 0
104,000	Stk.	Feb. 13	6	Bromley, Ord. 5 p.c.	116—119	..	5 0 10
165,700	,,	,,	4½	Do. do. 3½ p.c.	86—89	..	5 1 2
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	11—11½	..	6 1 9
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
150,000	20	July 15	7½	Cagliari, Ltd.	24—25	..	5 16 0
100,000	10	—	—	Cape Town & Dis., Ltd.	4—6	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	5—7	..	6 8 7
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	48—50	+1	6 0 0
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	78—83	..	5 8 5
157,150	Stk.	Aug. 13	5	Chester 5 p.c. Ord.	108½—110½*	..	4 12 7
1,493,280	Stk.	Mch. 12	5⅛	Commercial 4 p.c Stk.	106—111	..	4 13 8
560,000	,,	,,	5	Do. 3½ p.c. do.	101—106	..	4 14 4
475,000	,,	June 26	3	Do. 3½ p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	June 12	6½	Continental Union, Ltd.	110—115	..	5 13 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	136—141	..	4 19 3
460,170	Stk.	—	5½	Derby Con. Stk.	121—123	..	4 9 5
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
148,995	,,	Mch. 31	5	East Hull 5 p.c. Ord.	100—103	..	4 17 1
486,090	10	July 15	12	European, Ltd.	22½—23½	..	5 2 2
354,060	10	,,	12	Do. £7 10s. paid	16½—17½	..	5 2 10
15,182,590	Stk.	Aug. 13	4/10/8	Gas-light and Coke (4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb.)	97—99*	+½	4 11 7
2,600,000	,,	,,	3½		86—89*	+½	3 18 8
3,799,735	,,	,,	4		104—107*	..	3 14 9
4,193,975	,,	June 12	3		83—85	..	3 10 7
258,740	Stk.	Mch. 12	5	Hastings & St. L. 3½ p.c.	93—93	..	5 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.	112—115	..	5 13 1
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	18—19	..	5 15 9
4,940,000	Stk.	May 14	8	Imperial Continental	180—182	..	4 7 11
473,600	Stk.	Aug. 13	3½	Do. 3½ p.c. Deb. Red.	94—96*	+¾	3 12 11
195,242	Stk.	Mch. 12	6	Lea Bridge Ord. 5 p.c.	113—118	..	5 1 8
561,000	Stk.	Feb. 27	10	Liverpool United A	232—234	..	4 5 6
718,100	,,	,,	7	Do. B	166—168	..	4 3 4
306,083	,,	June 26	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 26	6	Malta & Medn., Ltd.	4¼—4⅜	..	6 6 4
560,000	100	Apl. 1	5	Met. of (5 p.c. Deb.)	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne (4½ p.c. Deb.)	101—103	..	4 7 5
541,920	20	May 29	3½	Monte Video, Ltd.	11—12	..	5 16 8
1,775,892	Stk.	July 30	4/12/6	Newc'tle & G'tesh'd Con.	107½—108½	..	4 5 3
418,463	Stk.	June 26	3½	Do. 3½ p.c. Deb.	90—92	..	3 16 1
15,000	10	Feb. 27	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	140—143	..	5 11 11
60,000	5	Mch. 27	7	Ottoman, Ltd.	6—6½	..	5 7 8
398,490	5	Apl. 29	7	Primitiva Ord.	6—6½	..	5 7 8
796,980	5	July 30	5	Do. 5 p.c. Pref.	4⅞—5⅛	..	4 17 7
488,900	100	June 1	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
1,000,000	10	Apl. 29	8	River Plate Ord.	13¼—13⅜	..	5 16 5
312,650	Stk.	June 26	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
250,000	10	Apl. 10	8	San Paulo, Ltd.	13½—14	..	5 14 4
125,000	50	July 1	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Mch. 12	10	Sheffield A	245—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
523,500	,,	,,	10	Do. C	244—246	..	4 1 4
70,000	10	May 29	10	South African	13—14	..	7 2 10
6,429,895	Stk.	Aug. 13	5/6/8	South Met., 4 p.c. Ord.	118—121*	+1½	4 8 1
1,895,445	,,	July 15	3	Do. 3 p.c. Deb.	83—85	..	3 10 7
209 820	Stk	Mch. 12	8	South Shields Con. Stk.	155—157	..	5 1 11
605,000	Stk.	Aug. 13	5/6/8	S'th Suburb'n Ord, 5 p.c.	113—116*	..	4 9 7
60,000	,,	,,	5	Do. 5 p.c. Pref.	117—122*	—½	4 2 0
117,058	,,	July 15	5	Do. 5 p.c. Deb. Stk.	120—125	..	4 0 0
502,310	Stk.	May 14	5	Southampton Ord.	108—113	..	4 8 6
120,000	Stk.	Aug. 13	6¾	Tottenham (A 5 p.c. and B 3½ p.c.)	117—122*	+⅜	5 10 8
398,940	,,	,,	5¼		105—108*	+⅛	4 17 3
149,470	,,	June 26	4	Edmonton (4 p.c. Deb.)	98—103	..	3 17 8
182,380	10	June 12	8	Tuscan, Ltd.	10—10½	..	7 12 4
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
193,742	Stk.	Feb. 27	5	Tynemouth 5 p.c. max.	106—107	..	4 13 6
255,636	Stk.	Feb. 13	6½	Wandsworth (B 3½ p.c. and 3 p.c. Deb. Stk.) Putney	128—133	..	4 17 9
80,075	,,	June 26	3		72—77	..	3 17 11
845,872	,,	Feb. 27	5⅛	West Ham 5 p.c. Ord.	101—104	..	4 18 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
228,300	,,	June 26	4	Do. 4 p.c. Deb. Stk.	100—105	..	3 16 2

Prices marked * are "Ex div."

SEVILLE WATER-WORKS COMPANY, LIMITED.

The Difficulties of Drought.

There are signs of improvement in the position of this Company, owing to the evidences of the breaking of the long drought, which has caused considerable anxiety and expense, and retarded progress. This was the most favourable feature of the proceedings at the recent meeting at the Cannon Street Hotel, when Mr. Cowley Lambert presided. The report which he had to present stated that the income amounted to £36,712. After deducting working expenses, the cost of laying on services, and the interest on debentures, the net profit for the year was £5968, compared with £3153 in the previous twelve months. To this sum was added the unappropriated profit at March 31, 1907 (£7453); and the amount standing to the credit of profit and loss account was £13,422, which, having regard to the financial requirements of the Company, the Directors recommended should be carried forward. The Directors also reported that they had advanced a step in the proposed scheme for supplementing the present supply of the city with potable filtered water from the Guadalquivir. The scheme had been completed, and had been presented to the authorities in order to obtain their sanction. The Consulting Engineer had so designed the work that an outlay of about £10,000 should provide sufficient additional water to assure a constant supply to the city for a long time.

In the course of his remarks, in moving the adoption of the report, the Chairman said he thought they might congratulate themselves on the figures; for, as would be seen, the amount transferred to profit and loss account was £5968, against a sum of £3153 in the previous year. The increase of 96,466 pesetas was derived from an increase in income of about 11,000 pesetas, and a decrease in expenditure of some 85,464 pesetas. It was right, however, that he should point out that this rather large decrease in expenditure was in comparison with a year which was somewhat abnormal. It was due to the decrease in maintenance and repairs of 9648 pesetas. In pumping and engine charges, there was also a decrease of 19,995 pesetas. This was owing to the fact that in the preceding year there was a large expenditure on the boilers at Las Delicias, and for overhauling the engines at both the pumping-stations. There was a decrease in taxes of 38,021 pesetas, because during the previous year, the Directors made a large reserve against the arrears of the debenture interest-tax. Finally, there was a large decrease in the expenses in connection with the drought—of 83,893 pesetas, which was due to less water being taken from the Municipality, because, on account of the drought, they had not themselves any water to sell the Company. There was at last a good rainfall in the autumn; and there had been a fair amount of rain this year. But the Company's Consulting Engineer did not encourage them to expect any immediate advantage from this, owing to the level of the water having been so lowered in the ground by continuous pumping and the rate of percolation being so slow. In regard to the river water scheme mentioned in the report, he could only say it had gone forward for the approval of the authorities; but the Directors were told that it would have to pass through no less than thirteen different stages before it could be approved, so that it would probably take some little time. He might say, however, that there was considerable opposition to the scheme in Seville, occasioned apparently by ignorance of the facts and prejudice; and the Board could only hope the project, when it became better understood, would be accepted by the people, and that they would realize that other great cities in Europe derived their supply of water from rivers, purified by the advanced methods of science and hygiene, and that, if they chose, they could have a plentiful and constant supply of water from the Guadalquivir as the people of London had from the Thames. Mr. J. J. Bithell had been appointed their Manager in Seville. He was making himself conversant with the intricate working of the Company's affairs. Mr. Wilson had resigned his seat at the Board; but they were pleased to say the Company would still have his services as Consulting Engineer.

The motion having been seconded by Mr. F. S. Jackson, there was a long discussion, but purely on details and domestic matters. The motion was then unanimously carried. Following this, the retiring Directors (Mr. Cowley Lambert and Mr. T. Castañeda) and the Auditors (Messrs. Deloitte, Plender, Griffiths, and Co.) were re-elected.

Reductions in the Price of Gas.

The Directors of the Shotley Bridge and Consett Gas Company have announced a reduction of 2d. per 1000 cubic feet in the price of gas from the 1st of October next. The Normanton Gas Company have reduced the charge for gas supplied for street lighting from 2s. 10d. to 2s. 9d., and for that used in the public offices from 3s. 2d. to 2s. 9d., per 1000 cubic feet. The Directors of the Croydon Gas Company have decided to reduce the price of gas 2d. per 1000 cubic feet as from the end of the current quarter. The Doncaster Corporation have made a similar reduction. The Newark Gas Company have reduced the price of gas, from the 21st of June last, from 2s. 8d. to 2s. 6d. per 1000 cubic feet to consumers in the borough, and from 3s. 2d. to 3s. to those beyond. To slot-meter consumers, 2 additional cubic feet of gas will be supplied per 1d., as soon as the necessary changes can be made in the meters. At the half-yearly meeting of the Peterborough Gas Company last Tuesday, the Directors reported that they proposed to make a further reduction in the price of gas—viz., for lighting purposes, from 2s. 9d. to 2s. 8d., and for power purposes (to consumers of 25,000 cubic feet per quarter) from 2s. 5d. to 2s. 4d. The Directors of the Bournemouth Gas and Water Company announce a reduction of 3d. per 1000 cubic feet in the price of gas used for lighting purposes—to take effect from the 29th prox. At Magherafelt, where Miss Richmond has charge of the gas-works, there is to be a reduction of 3d. per 1000 cubic feet in the price of gas used for lighting, and of 4d. in respect of gas used for other purposes. The Gas Committee of the South Molton Town Council have decided to reduce the price of gas for motive power by 10 per cent. where the consumption is from 30,000 to 150,000 cubic feet, and by 15 per cent. where it exceeds the latter quantity.

ANOTHER BIG CONTRACT

The Alliance and Dublin Consumers' Gas Company have recently placed with us their contract for Gas Cooking and Heating Apparatus, including their Installation business, for a number of years.

This contract was secured in open competition.

JOHN WRIGHT & CO.,
ESSEX WORKS,
BIRMINGHAM.

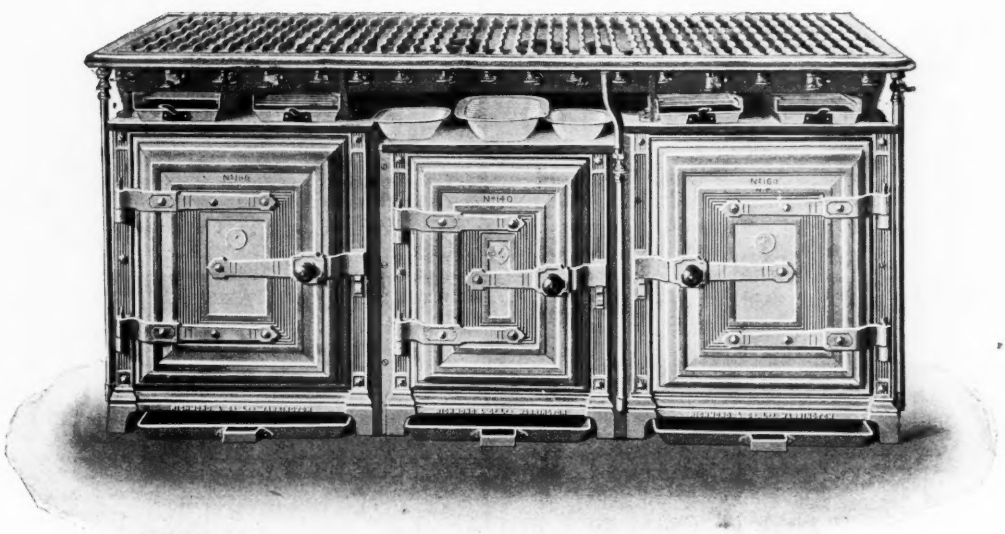
NOTES FROM SCOTLAND.

From Our Own Correspondent. *Saturday.*

The announcement is made that "the accounts of the Greenock Corporation Gas Department show a deficit on the year's working of £2755. In explanation, the Gas Manager states that the extraordinary state of the coal market last winter was responsible for coal expenditure exceeding the estimate by £446. Increased cartage, extra cost of water, and an increased expenditure of £287 for boiler fuel entailed a deficit of £430. As a result of a greater output of gas-stoves, due to the exhibition, there is a further loss of £117. Among other increases in expenditure are £52 for commission on loans, and £121 expenses incurred for gas exhibition and compensation for damage." The Gas Committee have appointed a Sub-Committee to consider the balance-sheet and the Manager's report upon the deficit; and it is stated that the price of gas will probably be increased by 2d. per 1000 cubic feet. At present it is 2s. 8d., at which it was fixed two years ago. At the same time the Town Council appropriated £1700 for general purposes out of a surplus on the gas accounts amounting to £2856.

Negotiations are in progress which bid fair to bring to an end the strained relations, to use a diplomatic phrase, which have existed for some time between the Corporation of Glasgow and the Busby Gas Company, Limited. The Company was formed in 1888, but for about fifty years prior to that year gas had been supplied in the district by a pre-existing Company. Part of the district served by the Company lies within the area of supply of the Glasgow Corporation, who, however, have not hitherto exercised their powers. In December last, on a recommendation by the Gas Committee, the Corporation resolved to extend their mains to the limits of supply in the Busby district, and at the same time they offered to take over the mains and pipes of the Busby Company at a fair valuation. The offer was not accepted by the Company, who, by way of self-protection, reduced the price of gas to 2s. 3d. per 1000 cubic feet within the threatened area. This gave rise to great dissatisfaction among the Company's consumers in the other portion of their district, upon whom the charge of 4s. 7d. continued to be made. This was a situation which could not last long, and consequently a letter was recently sent by the Law Agents of the Busby Company to the Gas Committee of the Corporation, in which the offer was made to sell the part of the Company's undertaking within the parishes of Cathcart and Eastwood, for the sum of £9000. The offer included all the mains, pipes, services, meters, stoves, cookers, and all appliances and fittings belonging to the Company within the Corporation area of supply, but subject to the conditions: (1) That no part of the gas-works nor plant therein . . . nor the main pipes leading from the gas-works and within Cathcart parish, conveying gas to their remaining area of supply, are included in the sale; (2) that the Company have full liberty, so far as the Corporation are concerned, to lead through the statutory area of supply of the Corporation further main pipes from their works to houses and places outside the Corporation's area of supply; and (3) that the Corporation, while they have liberty to supply the Whitecraigs district of Mearns parish, shall not, without the Company's consent, supply gas either directly to any consumer or consumers outside the Corporation's area of supply in the parishes of East Kilbride, Carmunnoch, Eaglesham, and Mearns, or in bulk to a competing company or companies which may start in competition with the Busby Gas Company. The Gas Committee recommended: (1) That the offer be accepted by the Corporation subject to (*a*) conditions Nos. 2 and 3 being modified or withdrawn, or a plan, as now explained, being adjusted between the parties relative to those conditions, and (*b*) a minute of agreement being satisfactorily adjusted between the Company and the Corporation; and (2) that in the event of the Corporation approving of the recommendation, it be remitted to the Sub-Committee on the acquisition of the mains and pipes of the Company, with power to adjust the proposed agreement. The proposals did not meet with anything like universal acceptance. Particularly, they were not agreeable to the residents within the Busby area which was not to be supplied with gas from Glasgow. At a meeting of the Glasgow Corporation on Thursday, a letter was read from the Hon. Secretary of the Busby and District Ratepayers' Committee, in which it was stated that the Committee were surprised to learn that in the agreement it was proposed to insert a condition prohibiting the Corporation from at any time giving a supply of gas in bulk to any company which might enter into competition with the Busby Gas Company in their remaining area of supply. If, it was stated, that condition were allowed to remain, Busby would be left without any remedy should the Company at any time propose to levy an oppressive rate. The price proposed to be paid—£9000—was undoubtedly a full one. The Corporation, by allowing the conditions, were tying the hands of themselves and their successors. The attention of the Corporation was directed to the question whether they had the power to agree to the condition; and whether it was a legal one. Bailie M. W. Montgomery moved approval of the recommendation of the Committee. One way of getting a valuation placed upon the mains and pipes was by arbitration; and in justice to the Company he might say that they were quite agreeable to submit the question to an arbiter. The Gas Committee, however, thought it inadvisable to put the matter before an arbiter. The Committee felt that the best thing to do was to try to fix mutually a fair and reasonable price. Some might think that the figure was rather high, and he dared say that there was something to be said for that; but when a man wanted to sell a business, he was anxious to get the best possible price for it. He did not think that the business would be a paying one for the Corporation for some time; but he had not the slightest doubt that it would prove a splendid investment for the Gas Committee. Mr. Alston said it had been reported that the total value of the Company's undertaking was £10,000. He was credibly informed that this amount was never paid up, and that the sum on pipes and meters was above the whole value of the money invested in the Company. Very little had been added to the works since the

Richmond's "HOLBORN" Cooker.



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concern was bought 21 years ago for £1000, and now it was proposed that the Corporation should pay £9000 for old pipes which had been lying in the ground and were of no use to anybody. He thought the subject should be sent back to the Gas Committee for further consideration. A letter from the Law Agent of the Company was read, intimating withdrawal of condition No. 2, and the modification of condition No. 3. After discussion, Bailie Montgomery agreed to take the subject back for consideration and report.

The Forres Gaslight Company, Limited, have paid a dividend at the rate of 5 per cent.

The Lanark Gas Company, Limited, have paid a dividend at the rate of 10 per cent. When intimation to this effect was made to the Lanark Town Council this week, the question was asked whether there was any proposal to reduce the price of the gas, to which the Clerk replied that there was not; and the retort was immediately forthcoming: "It is a scandal that they should pay 10 per cent." The Corporation are endeavouring to acquire the undertaking of the Company.

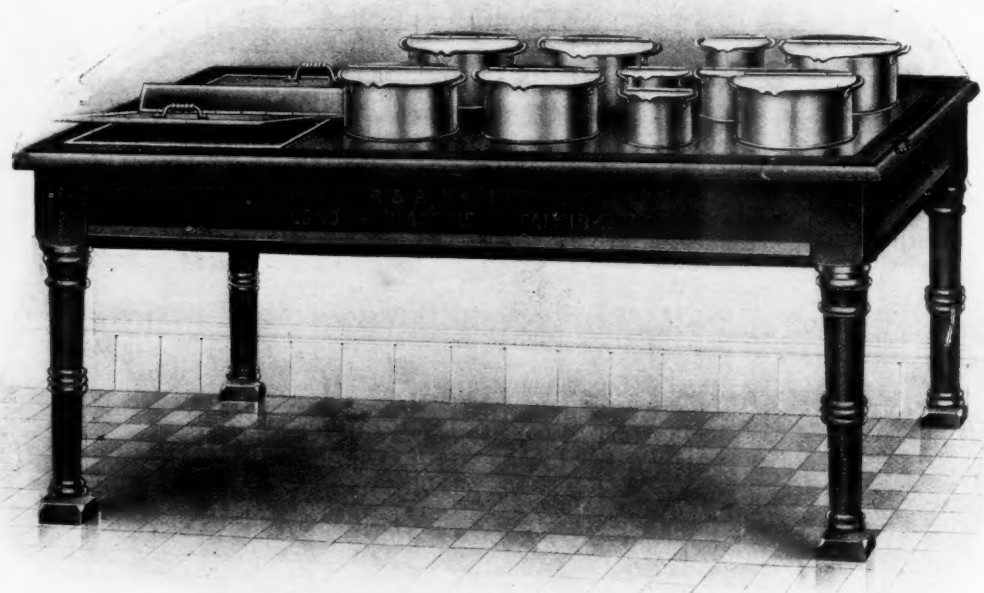
In a letter which is published in the "Scotsman" of to-day, the writer complains of a recurrence, during the past week or two, of the smells from the Granton Gas-Works from which residents in the Trinity district suffered two or three years ago. The Gas Commissioners, he says, spent large sums in effecting improvements which prevented the fumes from escaping, and, as a consequence, the air has been pure and free from those abominable smells; but the trouble has commenced again. The Gas Commissioners have proved very effectually, he goes on to say, that the smells can be stopped; and it is particularly disquieting that they are again causing complaint. Has, he asks, it anything to do with the lowering of the candle power recently resolved upon? The writer is loth to think that the Gas Commissioners can be cognizant of what is going on; and he would therefore recommend them "to give Mr. Herring clear, definite instructions to put a stop to this nuisance once for all, and see that these instructions are adhered to."

The Broughty Ferry Town Council had before them on Monday a question relating to the gas accounts for the past year, which were adopted by the Council a month ago. It transpired that on July 14, the day after the accounts were adopted, ex-Bailie Sim wrote a letter to the Scotch Department, in which he put three questions, these relating to the restoration of the contingent fund, the transference of a steam-boiler from the Electricity to the Gas Department, and the disposal of the £3500 which was obtained from Government for the Castle Green. His allegation was that £1700 or £1800 was not sufficiently accounted for in the gas accounts; and he claimed the support of the Scotch Office in obtaining an answer from the Council as to the points raised. It will be remembered that a month ago it was stated that the contingent fund was suspended when the deficit in the Gas Department was discovered, and that when the crisis was past the need for such a fund had passed also—the gas-works being now fully insured. The fund has, therefore, not been restarted, nor the amount which was borrowed from it refunded. The boiler, which supplied steam to the Electricity Department, is situated in the retort-house of the gas-works; and when new boilers were placed in the electricity works, the gas, works being in need of more steam power, the boiler was made over to the Gas Department as a *quid pro quo* for the Gas Department having, as required by statute, paid deficits in the Electricity Department, amounting to £1200. The Castle Green fund was lent to the Gas Department in their time of need, but has now been restored to the burgh funds. These are the answers to Mr. Sim's questions. In the Council he said he would give notice of motion on the subject; but he was not done with gas matters. He wanted to know if the Council had embarked on a policy of giving slot-cookers free without consulting the Council. The Gas Manager—Mr. G. Keillor—on being invited to explain, stated that the Council a considerable time ago resolved to give a slot-cooker or griller free of charge for hire; it being believed that the extra charge for gas would more than compensate for the service. Mr. Sim declared himself as not satisfied with the explanation, and as holding the belief that many curious things were done by the Gas Sub-Committee. The Gas Convener—Mr. J. P. Crystall—read the minute of the Council which the Manager had referred to, and stated that they had under consideration the larger question of giving cooking-stoves on similar easy terms. This was all the information elicited; but Mr. Sim will in all probability bring some of the matters up again.

Mr. S. B. Langlands, the Inspector of Lighting in Glasgow, recently reported to the Watching and Lighting Committee that he had been engaged in testing certain of the numerous makes of automatic lighting and extinguishing apparatus for gas-lamps, and that for some time past experiments have been going on in many cities to determine the commercial value and the reliability of various types of appliances, but that, before giving a final opinion, it seemed to him to be very desirable that these installations should be examined. The Committee agreed, and recommended that Mr. Langlands be authorized to visit London, Bristol, Liverpool, Manchester, and Bath, where such systems are in operation, and thereafter submit a report.

The half-yearly meeting of the Coatbridge Gas Company was held on Tuesday—Mr. J. Johnston presiding. The Chairman, in moving adoption of the report of the Directors, which intimated a reduction in the price of gas to 2s. per 1000 cubic feet to ordinary consumers, to 33 cubic feet for a penny to prepayment meter consumers, and to 1s. 7d. per 1000 cubic feet for power purposes, stated that the Directors had agreed to approach the Board of Trade for sanction to reduce the illuminating power of the gas, owing to the universal adoption of incandescent gas lighting. This would further reduce the price of the gas. The sales of gas for illuminating, cooking, heating, and motive power amounted to 80,359,926 cubic feet—a decrease over the previous corresponding period of 571,212 cubic feet, caused by the present depression of trade. The report was adopted, and dividends were declared at the rate of 11 per cent. on the old and £7 14s. per cent. on the new stock. At present the Company are authorized to supply gas of 20-candle power, but actually supply gas of 22½ candles.

LARGE POLISHED COPPER
"BAIN MARIE."



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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 15.

Sulphate of Ammonia.

In the early part of the week, there was good a demand for ready parcels, and a further advance in values was scored at all points. Towards the close, however, demand has been less keen, and the highest prices paid are hardly now obtainable. The closing quotations are £11 7s. 6d. per ton f.o.b. Hull, £11 10s. per ton f.o.b. Liverpool, and £11 12s. 6d. per ton f.o.b. Leith. A considerable business for delivery ahead has also been done, more especially for January-April, in which position £12 up to £12 2s. 6d. per ton has been paid. Buyers have, however, "jibbed" at the demand for a further advance, and have become somewhat indifferent. For October-March, £12 per ton has been quoted, but not reported paid; buyers' ideas not being over £11 15s. per ton.

Nitrate of Soda.

This article has been very quiet in all positions, but spot prices remain 10s. per cwt. for 95 per cent., and 10s. 3d. for refined quality.

LONDON, *Aug.* 17.

Tar Products.

We are still without any improvement in the market, and, with the exception of creosote, prices are on the whole weak. There has been no particular business done in pitch to make an alteration either way. Creosote keeps firm and maintains its price. In benzol, there appears to be a sign that it is going lower. No business of importance is reported in crude carbolic.

The average values during the week were: Tar, 11s. 6d. to 15s. 6d., *ex* works. Pitch, London, 18s.; east coast, 17s. to 17s. 6d.; west coast, 16s. to 17s., f.a.s. Benzol, 90 per cent., casks included, London, 7d. to 7¼d.; North, 6¾d.; 50-90 per cent., casks included, London, 7¼d.; North, 6¾d. Toluol, casks included, London, 7½d. to 7⅝d.; North, 7d. to 7¼d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 3d. to 3¼d.; solvent naphtha, casks included, London, 10d. to 10½d.; North, 9d. to 9½d.; heavy naphtha, casks included, London, 9⅝d. to 10¼d.; North, 8⅝d. to 9¼d. Creosote, in bulk, London, 2⅝d. to 2¾d.; North, 2⅜d. to 2½d. Heavy oils, in bulk, 2⅞d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 4d. to 1s. 4¼d.; west coast, 1s. 3½d. to 1s. 3¾d. Naphthalene, £4 10s. to £8 10s.; salts, 35s. to 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

After a certain amount of excitement, there appears to be a slight lull in the market; and though not much business has been reported during the last day or two, the market is inclined to have an upward tendency. The principal Gas Companies quote £11 15s. to £11 17s. 6d., September-December. In London, the prices are £11 5s. to £11 7s. 6d., Beckton terms; Leith, £11 10s. to £11 12s. 6d.; Hull, £11 5s.; and Liverpool, £11 6s. 3d. to £11 7s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a growing demand for coals, and the prices are generally firm for fuel for prompt or early delivery; but for forward delivery, buyers look for some concessions. Best Northumbrian steam coals are from 15s. to 15s. 3d. per ton f.o.b. For second-class steams, the quotation is from about 12s. to 12s. 6d., with one or two kinds a little above and a little below these figures; and steam smalls are steady at from 5s. 9d. to 6s. 9d. The production is now fairly heavy; but it is generally well taken up. In the gas coal trade, the home consumption is slowly growing, and the exports are full. Durham gas coals are being quoted from about 10s 6d. to 11s. 3d. per ton for usual kinds, and for "Wear" specials from 11s. 9d. per ton f.o.b. In contracts, there is rather less reported this week. Some further sales are believed to have been made for export at prices which—with a usual allowance for freight—would leave somewhere near 9s. 9d. to 10s. per ton f.o.b., for good Durham gas coals. Other contracts are in the market. Coke is steady, and gas coke is now rather scarce for export, so that the price is firmly held—at from about 15s. 9d. to 16s. per ton f.o.b. for good gas coke.

Scotch Coal Trade.

The improvement noted last week has been fully maintained, and now there is no difficulty in getting the output of the collieries taken up. Prices, however, have scarcely been affected. Small sorts are in least demand. The prices quoted are: Ell, 10s. 9d. to 12s. 9d. per ton f.o.b. Glasgow; splint, 10s. 9d. to 11s.; steam, 10s. to 10s. 3d. The shipments for the week amounted to 332,888 tons—an increase of 90,850 tons upon the previous week, but a decrease of 10,350 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,321,015 tons—a decrease of 419,324 tons upon the corresponding period of 1907.

Gas Progress at Camborne.—A year of steady progress was reported at the annual meeting of the Camborne Gas Company last week. Mr. H. P. Vivian, who presided, said that the make of gas had increased by 1,100,000 cubic feet, and the income by £785, compared with the previous year. The profit was £717; and the Directors recommended a dividend of 3 per cent. for the half year, making a total of 5½ per cent. for the year. It had been decided to extend the mains to the districts of Beacon and Troon; and when this was done the Urban District Council had agreed that the number of public lamps should be increased from 194 to 250. To meet this expenditure 200 new shares were offered, and were readily taken up at a premium of 7s. per share, and ten 4 per cent. debentures of £100 had also been issued. In regard to the public lighting, a contract had been entered into for ten years on satisfactory terms. The report was adopted, and the dividend recommended was declared.

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THE NEW AUTOMATIC "RAPID" (No. 1908) CIRCULATING BOILER marks a big step towards securing a high and regular Summer Consumption.

The usual objection brought against boilers of this type where hard water is used is absolutely squashed. The fear that the circulator may become furred up is minimised, owing to the method of construction specially employed.

Servants cannot waste the consumer's gas, for the Automatic Device—sensitive, reliable, and uncomplicated—cuts down the supply when the burner has done its work.

We are anxious that you should inspect and test a sample "Rapid" without delay.

DAVIS—the Gas Stove People.

CAMBERWELL, LONDON, S.E.

Another Scare by the "Lancet."

Under the heading "Are Londoners Poisoned by Coal Gas?" the "Lancet" last Saturday made the following remarks on the subject of the Gaslight and Coke Company's unaccounted-for gas in the past half year: "The forcing of coal gas through mains and service-pipes is obviously a very clumsy method of supplying lighting and motive power, when we consider the remarkable statement recently made at a meeting of one of the large Metropolitan Gas Companies to the effect that during six months no less than 110 million cubic feet of gas had not been accounted for. That this is due, among other things, to actual leakage seems probable, seeing that the gas officials themselves attribute this increased wastage to the greatly enhanced weight of the vehicles using the public roads and to the speed at which they were driven. Two years ago, we drew attention to the question of the extra strain brought to bear upon the roadway by motor traffic, which possibly the countless mains under its surface may not be able to withstand. Increased pressure is one factor; but a still more destructive one is probably vibration. Those who are unfortunate enough to live on the margin of roadways now invaded by a regular service of motor omnibuses are complaining loudly, justly, and apart altogether from the irritating noise, of the severe vibrations. The houses tremble to their foundations, the windows shake, the glasses clink, and the panels rattle. If the houses are affected in this way, it is very probable that the service-pipes under the streets must undergo a strain which is not calculated to increase their efficiency as carriers of water, gas, or electricity at high pressure. We cannot pass over the extraordinary statement in regard to this colossal leakage of coal gas with equanimity. It seems to us the matter calls for public inquiry; for it is obvious that grave dangers may arise from the escape of the potentialities existing under the roadways. Even though we may not hear of serious accidents, the fact remains that millions of cubic feet of poisonous gas are annually being distributed in the air of London. And it must be remembered that at least 10 per cent., and probably more, of this gas consists of the powerfully poisonous carbon monoxide. No wonder when there is no movement in the air, and when there is stagnant mist or fog present (a time, by the way, when the supply of gas is in great demand), Londoners are found to complain of headache, dizziness, and oppression, all three of which symptoms are readily invoked by chronic doses of carbon monoxide."

A Lamplighter's Narrow Escape.—While one of the Kirkcaldy lamplighters was engaged in lighting the lamps, he found one of the burners choked. Ascending the lamp-post, he put his head into the lantern, and cleared the obstruction by blowing into the pipe. On attempting to descend, he found his head was jammed in the door of the lantern, while all the time the gas was blowing into his face. He eventually got clear, but as he was feeling sick he made his way home, and shortly after entering the house he became unconscious. A doctor was called and found him to be suffering from gas poisoning; but after being attended to he regained consciousness.

Coke v. Coal for Pumping Water.—Testing experiments have been carried out at the Ryde Water-Works, to determine the calorific values of coal and coke. The best Welsh coal, consumed with natural draught, was tested against coke and small house coal consumed with forced draught; and it was found that a direct saving of 13s. 2¾d. was effected in the pumping of each million gallons of water by the use of the coke. It was stated at the meeting of the Town Council last Tuesday that a saving of £180 per annum would be effected as the result of the tests. An order was given to the Ryde Gas Company to supply 240 chaldrons of coke.

Disposal of the Gaslight and Coke Company's Bronze Coins.—There has lately been removed by death a man who earned his livelihood by disposing of the millions of coins collected from the prepayment meters of the Gaslight and Coke Company. His name was Alder; and he was known as the "Copper King." Last year, 155,257,900 copper coins, worth £647,000, were taken from these meters; and they weighed 1336 tons. Banks would accept only a small proportion of them, and Mr. Alder, after collecting them, drove round to his clients—publicans, factory owners, and others, who need a large supply of coppers for change, payment of wages, and similar purposes—and sold them a supply. He employed two assistants and kept four horses and carts for his work. He was paid on commission. It appears that Mr. Alder was the only man in his profession; and as his wife, being infirm, could not possibly undertake the work, it will now, it is stated, be done by the Company.

Gainsborough Gas Department.—A satisfactory year's work is reported in connection with the gas undertaking of the Gainsborough Urban District Council. The profit and loss account for the twelve months ending the 31st of March was presented at a recent meeting of the Council by Mr. Drust, the Chairman of the Gas Committee. It showed receipts to the amount of £15,925, and expenditure totalling to £15,254; leaving a profit of £671 for the year. Discounts to consumers amounted to £781—an increase of £84. Coal cost upwards of £1000 more than in 1906-7, and the renewal of mains and service pipes was a heavy item, being an increase of £268. Residuals realized more than before. The work of improving the lighting of the town has been proceeded with; nearly 200 more lamps having been converted to the incandescent system. The quantity of gas made in the year was 89,443,000 cubic feet, an increase of 4,349,000 cubic feet; and the coal carbonized was 7980 tons, an increase of 332 tons. The make of gas per ton of coal was 11,208 cubic feet, or 83 cubic feet more than in the preceding year. Gas cookers are still in demand; the number in use at the close of the year being 700 (an increase of 140); and more consumers are being added who are using gas for lighting purposes. The number of consumers on the 31st of March last was 2368—an increase of 201; and 12 additional public lamps have been added. The Committee and the Gas Manager (Mr. John Baldwin) were congratulated on the very satisfactory results obtained during the year, notwithstanding the increased cost of coal and the extra expenditure incurred in renewing mains and services.

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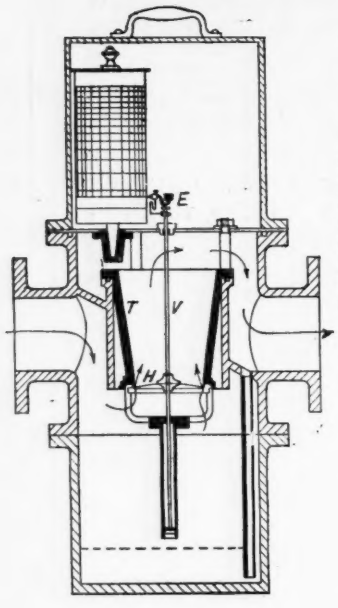

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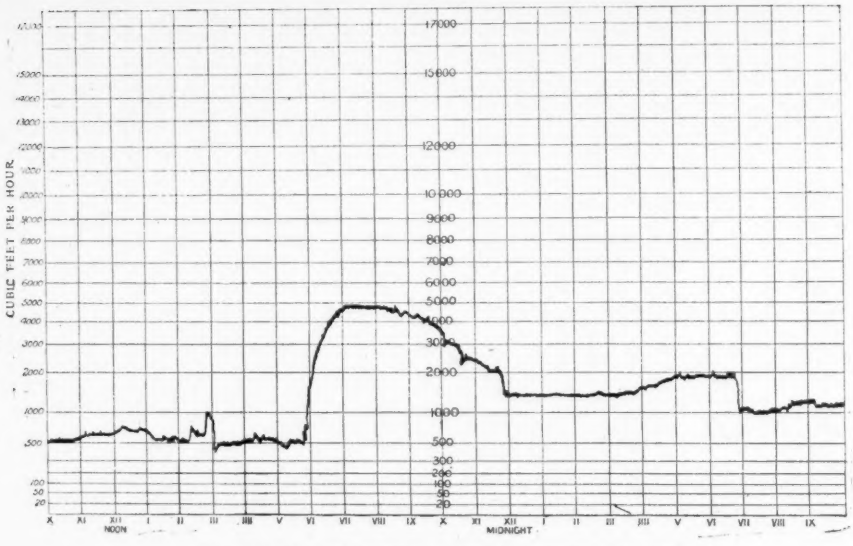


Fig. 259.—Record Taken on Thorp's Diagrammatic Meter

Telegrams—"Rotary, Manchester."
Telephone—5029.

T. G. MARSH,

28, DEANSGATE, MANCHESTER.

Wombwell Gas Supply.—At the last meeting of the Wombwell Urban District Council, it was recommended that application be made to the Local Government Board for sanction to borrow £1500 for proposed improvements at the gas-works. Mr. C. H. Elliott explained that this was a reduction of a proposed loan of £2770. At present the works were capable of producing about 300,000 cubic feet of gas per day, and it was believed that, by expending part of the £1500 in bringing the plant up to date, the daily yield could be increased to 400,000 cubic feet. The Council expected to recoup themselves in five years for the outlay.

Suicides by Inhaling Gas.—According to a report from Paris, a man named Leichemann committed suicide in that city in a novel manner. He bored a hole in a trunk, passed an india-rubber gas-tube through it, and turned on the gas. Then, entering the trunk, he shut the lid, and was quickly asphyxiated. His wife, on returning to the house with her young son, struck a match, and an explosion followed, by which both were rendered unconscious. They, however, subsequently recovered. At Bristol, last Tuesday, a verdict of "Suicide while of unsound mind" was returned in the case of Frederick Brain, a bootmaker, who was found dead in his office on the previous Sunday night with a pipe attached to a gas-bracket near his mouth, the gas escaping, and a coat spread over his head. It was stated in the course of the Coroner's inquiry that some years ago deceased had met with an accident which had impaired his mental faculties.

Quebec Gas Company.—The first number of the "Gas Journal of Canada" contains the following particulars in regard to the Quebec Gas Company. It was incorporated by Act of Legislature of the Province of Quebec in 1849, and the Company took over the rights and privileges then held by the Corporation of the city. A controlling interest in the Company was secured by a Syndicate of Canadian capitalists two years ago; and they immediately gave instructions for the preparation of plans for the improvement and extension of the old plant. This work has been in progress for upwards of a year, under the superintendence of the Manager (Mr. R. A. Wallace); and the Company are now in a position to meet all the demands upon them for gas. When they took over the plant, the prevailing net rates were $1·75 per 1000 cubic feet for lighting, and $1·25 for heating. But the improved facilities have rendered possible a reduction to a uniform figure of $1 per 1000 cubic feet. During the past financial year, there was a large increase in the number of consumers; and the total output of gas augmented to the extent of 50 per cent.

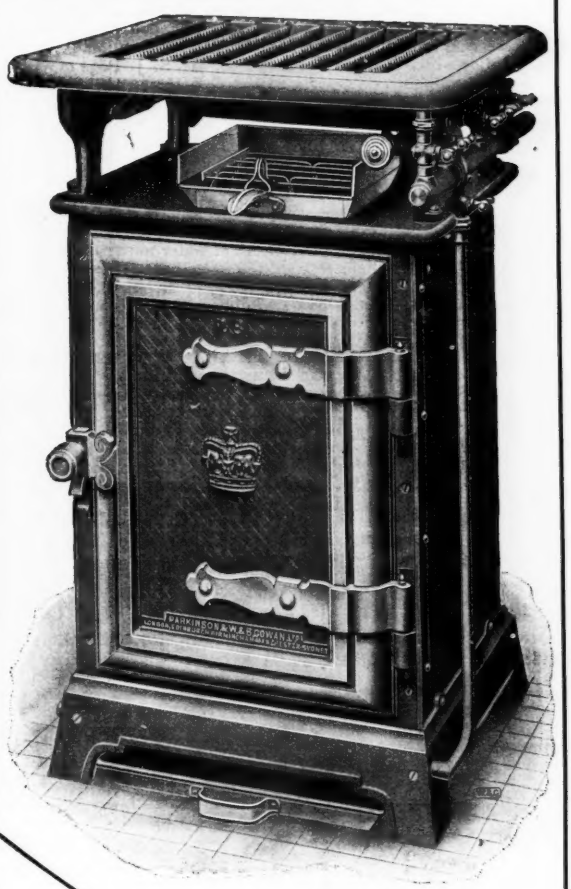
The "Builder" on London Gas Supply.—In a short editorial article on "Recent Gas Reports," the "Builder" last Saturday said: "The half-yearly reports of the three Metropolitan Gas Companies which have just been issued show that, although each Company has gained a large number of new consumers, each has sold less gas than in the corresponding period of the previous year. In no case does the decrease in the quantity sold amount to 2 per cent.; but, in view of the increased number of consumers, it is evident that the economy effected by the incandescent gas-burner, and more especially by the inverted form of the burner, has influenced the average gas account to a material extent. In the last ten years, the number of gas consumers in the South Metropolitan district has increased 94 per cent., while the gas consumption has increased only 37 per cent. This is due not only to the use of incandescent burners in place of flat-flame burners, but also to the fact that most of the new consumers live in small flats and tenement buildings and use prepayment meters. Abnormally high charges for coal, general depression in the trades and industries, and keen competition with other illuminants have not yet affected the prosperity of the gas industry to any material extent. The closing of factories and the poverty of those who become unemployed tend to reduce the demand for gas; but the industry has more opportunity of adjusting itself to meet adverse circumstances than most other business undertakings."

APPLICATIONS FOR LETTERS PATENT.

16,405.—Brooke, R. M., and Robert Dempster and Sons, Limited, "Vertical retorts." Aug. 4.
16,407.—Key, W., "Gas-burners." Aug. 4.
16,426.—Campbell, V. E., "Automatic cut-off for liquid and gaseous fuel burners." Aug. 4.
16,478.—Maclay, J. A., "Gas-fires." Aug. 5.
16,561.—Rodhe, O., "Pumps driven by means of compressed or rarefied gas." Aug. 6.
16,574.—Watson, H. B., and Billetop, T. C., "Condensers." Aug. 6.
16,604.—Esnault-Pelterie, R., "Internal combustion engines." Aug. 6.
16,610.—Versen, B., "Gas-producers." Aug. 6.
16,614.—Lake, W. E., "Manufacturing gas." A communication from the International Gas Development Company of the United States. Aug. 6.
16,623.—Frost, W. H., and Nix, J. J., "Production of gas from hydrocarbons." Aug. 6.
16,627.—Radcliffe, J., "Distillation of ammoniacal liquor." Aug. 7.
16,638.—Nichols, H., "Fire cleaner for suction-gas plants." Aug. 7.
16,645.—Potter, W. G., "Mantles for gas lighting and heating." Aug. 7.
16,646.—Dallas, G. A., "Self-contained metallic portable stands to carry gas-meters, waste-water tanks, and the like." Aug. 7.
16,656.—Birch, E., and Luger, R., "Gas-regulating devices." Aug. 7.
16,670.—Sefton-Jones, H., "Apparatus for detecting the presence of combustible gases." A communication from Hartmann Braun Aktier Gesellschaft and Emmanuel Amédée della Santa. Aug. 7.
16,678.—Robson, G., "Gas-cocks." Aug. 7.
16,692.—Fitton, J., "Carbonizing machines." Aug. 8.
16,697.—Schumacher, Q., "Valve for coke-ovens." Aug. 8.
16,699.—Crighton, J. D., "Exhaust silencer for explosion engines." Aug. 8.

THE
PARKINSON
STOVE CO., LTD.

"CROWN"
COOKER.



Many
Important
Improvements.

THE
PARKINSON
STOVE CO., LTD.,
STOUR ST., SPRING HILL,
BIRMINGHAM.

Chester Water Supply.—At the half-yearly meeting of the Chester Water Company last Thursday, the Chairman (Mr. F. E. Roberts), in moving the adoption of the report, said the Medical Officer of Health for the city had advocated additional water storage. This point had been under the consideration of the Board for several years, and they had had plans before them with the object of the provision of very largely increased storage, which would have the effect of tiding them over any difficulty in the matter of an impure river or floods, or anything else that might happen. They had the advantage in Chester of an unlimited water supply; and it was satisfactory to note that the excellence and purity of the water sent into the town was recognized by those in authority.

Rotherham Water Supply.—On the occasion of an inspection of the Rotherham Water-Works last Thursday, the Chairman of the Water Committee of the Corporation (Alderman C. J. Stoddart) gave the following particulars in regard to the water supply of the borough: In the year 1871, the population of Rotherham was only 25,000; and at that time they used 500,000 gallons of water per day, which worked out at about 20 gallons per inhabitant. Ten years later the population had increased to nearly 35,000; and the water consumed was 750,000 gallons. In 1891 the population was 42,000, and the water consumed 1,050,000 gallons. Now the population was 62,000, and the water consumed 1,600,000 gallons. If they took this forward for another twenty years, he estimated the population as being 110,000, and the quantity of water consumed 2,500,000 gallons per day. It was, therefore, incumbent upon the Corporation to look about them to see where they could get their future supplies from. They had done this to a certain extent, inasmuch as they had obtained the insertion in an Act of Parliament of clauses to the effect that, when the needs of Rotherham required it, they were entitled to a certain proportion of water from the Derwent.

Suggested New Trunk Water-Main at Plymouth.—In the minutes of the Water Committee presented to the Plymouth Town Council yesterday week, it was stated that the Water Engineer (Mr. Howarth) had submitted reports as to the existing means of conveying water between the Burrator and Roborough reservoirs, and also with respect to the condition of the Drake's Place reservoir, and that the matters had been referred to Sub-Committees for consideration. When the confirmation of the minutes was proposed, Mr. S. J. Page moved that copies of the Engineer's reports be supplied to the Council. It had come like a thunderclap at the "Fyshynge Feaste" to hear that a large expenditure was contemplated on the duplicating of the main between the storage reservoir at Burrator and the Roborough service reservoir. They were under the impression that the water-works were finished, and that no further expenditure would be necessary for many years. Mr. J. C. Brown thought the suggested outlay unnecessary, as they had the leat as an alternative means of supply. Mr. Tozer, the Chairman of the Water Committee, said that the last time the leat was tested, upwards of 3 million gallons of water were run into it, and of this only 500,000 gallons reached the reservoir at Roborough. The Sub-Committee would report on the whole question, and would consider how far the leat could be relied upon. The Committee's recommendation was adopted.

In the "JOURNAL" last week (p. 398), reference was made to a fire at Cowfold Lodge, which was thought to have been caused by an explosion of acetylene gas. Mr. Arthur Labouchere, the occupier of the house, has written to the Managing-Director of the Acetylene Corporation of Great Britain, Limited (Mr. H. E. Baker), who put in the plant, to the effect that there is not the least reason for thinking that acetylene gas was in any way the cause of the fire. Mr. Labouchere does not see any danger in it, and hopes to use it again when the house is rebuilt.

We have received from Messrs. Best and Lloyd, Limited, their new lists (Nos. 65 and 66) of "Surprise" pendants. The former is for pendants for inverted burners, and the latter for those with which upright burners are used; and in each list is shown a considerable assortment of patterns. Some are of light make, having been designed to meet the demand for a low-priced article; but in the case of the rest, the makers state that the original quality and strength have been maintained, and in many instances improved, though the prices have been considerably reduced.

The Kitson Empire Lighting Company, Limited, has been registered with a capital of £100,000, in £1 shares, of which 40,000 are 7 per cent. cumulative preference, to acquire from Mr. A. Kitson the benefit of certain patents and assets of the business carried on by him at 5, Hythe Road, Willesden, as the Kitson Light Foreign Supply Company; also to acquire from the Empire Light, Limited, of 100, St. Martin's Lane, W.C., certain patents for the invention known as the "Empire Light;" and, further, to carry on the business of manufacturers of lamps and stoves and other lighting and heating apparatus and plant, &c. The three signatories are A. Kitson, Scott Lings, and A. J. Hall—each taking one share. The Directors are to be not less than three nor more than seven. Mr. A. Kitson is a life Director; and others are to be appointed by the signatories. The debenture-holders have the right to nominate a director.

There was a large attendance of shareholders at the annual meeting of the Leeds Fire-Clay Company, Limited, last Wednesday. Mr. A. Barrett (the Managing-Director) presided, and, in moving the adoption of the report, said the Directors had a perfectly straightforward explanation to give why the profits were worse by £14,232 than they were a year ago. Their anticipations last year of no improvement had, he regretted to say, been fulfilled. In the glazed brick trade keen competition had prevailed, and for six or seven months the whole of the trade in the country was carried on either at a complete loss or at an infinitesimal margin of profit. Such severe cutting could not have lasted for long; and a reasonable arrangement of prices was made, on which practically all manufacturers were agreed. Instead of two firms dividing the trade between them, equal to 80 million bricks, there were now sixteen makers to share in the demand, which was equal to only 40 per cent. of the total. The Board felt the position very keenly; but they were conscious of having done everything possible to relieve matters. In conclusion, he said there was nothing wrong with the Company. They were suffering from bad trade, low prices, and excessive cost of materials, and from these causes only. The motion having been seconded, some sharp criticism was offered; but eventually the report was adopted.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

"ILLUMINATING TRUTHS."

LEAFLETS FOR DISTRIBUTION.

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."
No. 7.—"The Osram Lamp: Fiction and Fact."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

WATER ENGINEER. Hull Corporation. Applications by Aug. 28.
LECTURER IN GAS DISTRIBUTION. Goldsmith's College. Applications by Sept. 1.
TRAVELLER. No. 4979.
WORKING MANAGER. No. 4980.

Situations Wanted.

ASSISTANT. No. 4977.
CHEMICAL PLUMBER AND LEAD BURNER. Davis, Shepherd's Bush.

Plant (Second-Hand), for Sale.

ENTIRE GAS-WORKS PLANT. No. 4978.
RETORT BENCH MOUNTINGS, PIPES, &c. Lochgelly Gas Company.
STREET LANTERNS AND PILLARS. Thirsk Gas Company.

Plant, &c. (Second-Hand), Wanted.

EXHAUSTER. No. 4976.

Patents to Sell or Licences to Manufacture

GAS BURNERS, &c. Cruikshank and Fairweather, Chancery Lane, W.C.
LIGHTING AND HEATING BURNERS. Haseltine, Lake, and Co., Southampton Buildings, Chancery Lane, W.C.
REVIVIFICATION OF FILTERING MATERIAL. Haseltine Lake, and Co., Chancery Lane.
HEATING OR COOLING APPARATUS. Haseltine, Lake, and Co., Chancery Lane.
PIPE COUPLINGS. Lloyd Wise and Co., Lincoln's Inn Fields, W.C.
CHIMNEY TOP. Skerrett, Birmingham.
GAS BURNER, &c. Abel and Imray, Birkbeck Bank Chambers.

Meeting.

HARROW AND STANMORE GAS COMPANY. Holborn Restaurant. Sept. 7. Twelve o'clock.

TENDERS FOR

Coal and Cannel.

KILDWICK GAS COMPANY. Tenders by Sept. 2.
OTLEY GAS COMPANY. Tenders by Sept. 1.
ROCHDALE GAS DEPARTMENT. Tenders by Aug. 26.
SHEFFIELD GAS COMPANY. Tenders by Aug. 26.
STRATFORD-ON-AVON GAS DEPARTMENT. Tenders by Aug. 22.

Oil for Gas Making.

ROCHDALE GAS DEPARTMENT. Tenders by Aug. 26.

Roof (Steel).

BURNLEY GAS DEPARTMENT. Tenders by Aug. 26.